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FOREWORD.

The Farmers of Western Australia—

In many of us there is an inherent desire to serve our country, but not to everyone is given the opportunity that lies within the scope of the Department of Agriculture. The honour of administering this Department has been conferred upon me by the Head of the Government of this State, and it is due to you, the people of the agricultural districts, that I came within the ambit of his choice.

My thanks can be better expressed by action during my term of office rather than by words, yet I welcome the present opportunity of assuring you, through these pages, that I am thoroughly alert to the responsibility, importance, and opportunity of my position as head of the Department of Agriculture.

A native of the State, having spent most of my life in farming pursuits here, the success of the industry is my paramount ideal. Having been taught in the hard school of experience, my sympathy with you is assured and must form a close tie between us.

Realising the invaluable influence spread throughout the land by the Department of Agriculture, evidenced by improved practices consequent upon the lessons of experience, the discoveries of science, and the inestimable contributions these have made to the safe and rapid progress of agriculture in its widest scope, I have a very lively sense of its effect on our national development and income. Nature has endowed us with wonderful resources, which are ours to organise and exploit for the creation of national wealth and the general happiness and welfare of our people. I believe this can best be accomplished by listening to the voices of science and experience. The best known available sources for obtaining and collating the material have been brought together in the department now under my control, and the information is distributed per medium of the "Journal of Agriculture" by officers of the various branches of the Department specially appointed to their tasks. My aim will be to increase their usefulness so that the problems and difficulties of the pioneer settler and the advanced agriculturist will be investigated and eventually solved.

I am very grateful that, as one of the earliest acts in my new sphere, I was able to make an announcement regarding the generous offer of Mr. M. T. Padbury to contribute the sum of £150, in order to make provision for permanent prizes to encourage the production of bigger and still bigger crops of wheat in Western Australia.

This is to be achieved by providing for a perpetual competition amongst wheat growers whose area harvested for grain is not less than 200 acres, the competition to be won by the grower producing the greatest number of bushels of wheat per inch of rain received during the growing period.

To achieve this object, it is proposed that part of the sum donated shall be utilised for the purchase of a suitable trophy, which shall be held by the winner for one year, or until such time as it is won by some other grower; the balance of the money to be held in trust by the Royal Agricultural Society, of which Mr. M. T. Padbury is a former President, and the interest used to purchase a replica of the trophy, which shall be presented to and remain the property of the winner of the competition each year.

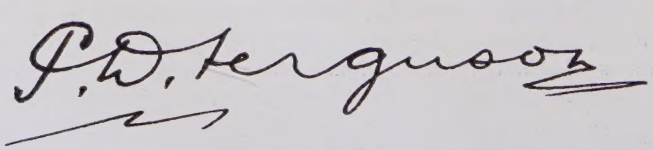
The trophy itself is to be sufficiently large to contain a suitable inscription setting forth the objects of the competition, and also contain the names of the successful competitors. The replica will have on it the name of the winner for the year in which it was won, but not the names of the other winners.

Having been closely associated with Mr. Padbury for a great number of years, I am not surprised at his generosity in this matter, for I know how keenly he is interested in the development and expansion of the agricultural industry in W.A., and the wheat section of that industry in particular.

This patriotic action on the part of Mr. Padbury should commend itself to not only the wheat growers of W.A., but to all those who have the welfare of the State at heart. It should have the effect of stimulating interest in those farmers who consistently produce good crops, and there is no doubt the friendly spirit of rivalry that it will engender will have a beneficial effect. The winning crops year by year will be inspected by neighbouring farmers, and some at least of these will be induced to emulate the methods of the winner of the trophy and those competitors whose crops rank high in the competition. Its effect must be to help to increase our yield per acre, and thereby our annual production.

At the moment we are experiencing a difficult situation, but it cannot avert, or for long retard, our march of progress. Prosperity is ahead of us if we have the will to succeed. With past successes to sustain and inspire us, and given a good season, I look to you confidently for co-operation in producing a record harvest this year in every branch of the industry, thus counter-attacking the demon of depression.

Yours faithfully,



Minister for Agriculture.

THE MINISTER FOR AGRICULTURE.

THE BATEMAN CENTENARY WHEAT GROWERS' CUP.

I. THOMAS,
Superintendent of Wheat Farms.

The Bateman Centenary Wheat Growers' Cup was donated by the family of the late J. W. Bateman, a gentleman who had watched and helped in the progress of the State since its earliest days as a colony. In order to link his name with the Centenary Celebrations of the State, and to show the keen interest he had taken in the State's progress, his family donated a gold cup, the product of Western Australian mines, valued at £50, to be presented to the farmer in this State whose wheat crop grown during the Centenary year (1929) gained the highest merit. Thus the two primary industries (gold mining and wheat farming) which have performed the greatest part in the State's progress, and the name of one of the most respected and loyal of her citizens are inseparably linked, and the aim of the late Mr. J. W. Bateman's family has been realised on the State's one hundredth birthday.

The competition was unique in the Commonwealth and possibly in the whole world. Invariably crop awards are made for the highest average yield per acre irrespective of the climatic conditions under which the competing crops are grown. It was desired to make this award for merit, and, as the competition was State wide, to endeavour to eliminate the advantages due to climatic conditions. It was therefore decided to make the award to the farmer who obtained the highest yield per acre for each inch of rain which fell during the conventional growing period (*i.e.*, from 1st May to 31st October inclusive).

The conditions under which the competition was conducted are as under:—

1. The cup was awarded for the crop grown during 1929, the Centenary year, to the grower who obtained the best average acre yield per inch of rainfall during the conventional growing period, viz., from 1st May to 31st October inclusive.

2. The rainfall upon which the award was made was determined by the Commonwealth Meteorologist from the district records, and his decision in this matter was final.

3. The competition was limited to those farmers who harvested at least 200 acres of wheat for grain. Where a competitor was financially interested in the crops grown on one or more farms, the total areas were included in the competition.

4. The average yield was ascertained from the total area harvested for grain and determined from the actual amount of wheat sold as shown by the delivery dockets plus the amount retained for seed and home use.

5. The method of judging was as follows:—The judge visited the farm of the competitor and at a convenient time measured up the stripped area and ascertained the quantity of wheat on hand. On or before 31st January, the farmer was required to furnish the judge with a sworn declaration as to the quantity of wheat sold from the competing holding, and the amount retained for seed and other purposes. The statement regarding the amount sold was supported by agents' dockets. The judge, after satisfying himself as to the correctness of this statement, computed the average yield per acre from the information received.

6. The judge was appointed by the Director of Agriculture and his decision is final.

7. Nominations for this competition were received by the Royal Agricultural Society up till the 31st of October, 1929.

The number of entries received was 110, but 87 only of the entrants fully complied with the conditions. These were located throughout the wheat belt, from Ogilvie in the North to Mukinbudin in the East and to Tambellup in the South.

Time, and the number of officers available, did not permit the area cropped by each competitor being measured up. It was decided, therefore, to obtain a statutory declaration from each entrant, and to measure up those who had a possible chance of winning. Many of the competitors, however, were taking part in the District Wheat Yield Challenge Shield Competition and were measured up in that connection. It so happens that of the first ten competitors in the tabulated list, in one case only was it necessary for the area to be measured up specially for the Bateman Cup Competition.

Before finality could be reached the disposal of all wheat harvested by competitors had to be checked to ascertain the total yield of each. In some cases the checking presented its own peculiar difficulties and gave rise to subsequent delay. In this connection thanks are due to the wheat merchants for their assistance in supplying details of wheat supplied to them from the different competitors.

The detailed results of the competition are tabulated below, together with a tabulated list of the rainfalls officially recorded at the nearest stations to the individaul competitors, kindly supplied by Mr. E. B. Curlewis, of the Commonwealth Meteorological Bureau:—

RESULTS.

Competitor.	Address.	Rainfall, 1929.			Yield.		
		Total points.	Growing Period, points.	Area harvested acres.	Gross B. lbs.	Average per acre, B. lbs.	Average acre per inch G.P. Rain, B. lbs.
McDonald, J. ...	"Springvale," Gnowangerup	1,613	1,087	279	10,233–56	36–41	3–22
Lohoar, W.	Borden	1,576	942	292	8,377–59	28–41	3–2
Richards, T. ...	South Caroling ...	...	917	380	1,0391–0	27–21	2–59
Formby, R. & Co., Ltd.	Formby Siding, *via* Gnowangerup	1,508	1,021	227	6,652–24	29–18	2·52
Mouritz, E. A. ...	Pallinup, *via* Gnowangerup	...	965	200	5,303–0	26–11	2–49
Willard & Willard ...	"Yladgee," Gnowangerup	1,613	1,087	249	7,551–24	30–20	2–47
Stone, J. D. ...	Borden	1,576	942	584	15,217–8	26–3	2–46
Booroondara Grazing Co., Ltd.	Toompup, nr. Ongerup	1,655	1,003	216	6,000–12	27–46	2–46
Murray, W. W. ...	Borden	1,576	942	423	10,773–0	25–28	2–42
Chambers, E. ...	Pallinup	...	965	280	6,951–21	24–49	2–34
Darby, A. H. ...	Lake Grace ...	1,604	959	200	4,802–8	24–1	2–30
Rudduck, S. A. ...	"El Cala," Coorow	1,265	975	860	20,907–0	24–19	2–29
Tom Moore	Indarra	1,290	1,082	300	7,856–18	26–11	2–25
Moir, C. C.	Arnelup, *via* Borden	1,851	1,089	220	5,776–28	26–15	2–25
Carter, R. & Sons ...	Three Springs ...	1,236	1,055	333	6,997–0	25–16	2–24
Stone, S. G. ...	Borden	1,576	942	231	5,177–0	22–25	2–23
Wilson, A. F. ...	Moulyinning ...	...	982	550	12,678–23	23–3	2–21
Prowse, E. W. ...	Doodlakine ...	1,383	874	453	8,629–24	19–3	2–11
Mott, C.	Moulyinning ...	...	982	249	5,298–0	21–17	2–10
Nottage, R. B. ...	Tammin	1,497	1,130	249	6,029–0	24–13	2–8
Smith, C. & Sons ...	Bruce Rock ...	1,365	963	2,765	56,972–0	20–36	2–8

RESULTS—continued.

Competitor.	Address.	Rainfall, 1929.			Yield.		
		Total points.	Growing Period, points.	Area harvested acres.	Gross B. lbs.	Average per acre, B. lbs.	Average acre per inch G.P. Rain, B. lbs.
Deane, Hammond J.	"Cuttening," Kellerberrin	1,548	1,107	300	7,059–0	23–32	2–8
Bishop, H. F. ...	Lake Grace ...	1,604	950	212	4,269–0	20–8	2–7
Mott, H.	Moulyinning ...	...	982	222	4,619·0	20–48	2–7
Troy, M. F. ...	Indarra	1,290	1,082	364	9,233–44	25–22	2–5
Thomas, C. F. & Sons	Three Springs ...	1,236	1,055	526	11,512–12	21–53	2–4
Prowse Bros. ...	Doodlakine ...	1,383	874	1,349	23,193–0	17–12	1–58
Eckermann, H. W.	Yandanooka ...	1,651	1,429	257	7,214–52	28–4	1–58
Saunders, W. S. ...	Yandanooka ...	1,651	1,429	241	6,735–8	27–57	1–57
Ellis, M. P. & E. G.	Bruce Rock ...	1,365	963	296	5,538–29	18–42	1–56
Hornsby & Son ...	Moulyinning ...	...	982	344	6,504–20	18–54	1–56
Garrett, G.	Bruce Rock ...	1,365	963	697	12,973–28	18–37	1–56
Cousins, A. H. ...	Three Springs ...	1,236	1,055	700	14,204–0	20–17	1–55
Clark, R. W. ...	"Rosebury," Carnamah	1,458	1,171	750	16,669–43	22–14	1–54
Johnston, J. H. ...	Nungarin	1,255	787	575	8,531–8	14–50	1–53
Creagh, Bros. ...	Nungarin	1,255	787	1,060	15,697–0	14–49	1–53
Woodbourne, J. ...	Lake Grace ...	1,348	950	281	5,018–0	17–50	1–53
Nichols, R.	Kulin	1,536	972	751	13,662–10	18–12	1–52
Folland, S. L. ...	"Enfield Park," Waddy Forest	...	953	590	10,390–0	17–37	1–51
Hocking, H. R. ...	Tammin	1,497	1,130	392	8,041–25	20–31	1–50
Trotter, A. W. ...	Kulin	1,536	972	464	8,292–22	17–52	1–50
Johnston, H. C. ...	Kulin	1,536	972	723	12,938–35	17–54	1–50
Fitzpatrick, R. C. ...	Nungarin	1,255	787	783	11,200–48	14–18	1–49
Henderson, J. H. ...	Kulin	1,536	972	483	8,572–47	17–45	1–49
Clarke Bros. ...	Moulyinning ...	...	982	315	6,014–54	19–6	1–47
Cook, W. T. ...	Burracoppin ...	1,616	936	400	6,691–0	16–44	1–47
Green Bros. ...	"Bushy Park Farm," Carnamah	1,458	1,171	640	13,200–58	20–38	1–46
Strutton, A. R. ...	Three Springs ...	...	1,055	546	10,216–3	18–43	1–46
Braysher, F. E. & Son	Kellerberrin ...	1,548	1,107	487	9,597–0	19–42	1–46
Brown, J. A. ...	"Raith," Yandanooka	1,651	1,429	270	6,608–0	24–28	1–43
Cusbert, L. C. ...	Bruce Rock ...	1,365	963	559	9,295–0	16–38	1–43
Quartermaine, R. ...	Yandanooka ...	1,651	1,429	229	5,616–0	24–31	1–43
Dumsday, L. ...	Goomarin ...	...	892	590	9,669–0	15–13	1–42
Mackin, C. C. ...	Tammin	1,497	1,130	558	10,454–0	18–44	1–40
Barr, D. F. ...	"Glen Laurall," Shackleton	991	1,441	610	9,975–5	16–21	1–39
Smith, H.	Yandanooka ...	1,651	1,429	545	12,760–4	23–25	1–38
Clarke, A. & J. ...	Kellerberrin ...	1,548	1,107	688	12,403–0	18–2	1–38
Muntz, J. N. & Son	Bruce Rock ...	1,365	963	379	5,840–0	15–24	1–36
Spillman, D. J. ...	Doodlakine ...	1,383	874	855	12.211–0	14–17	1–36
Uppill, G.	Tammin	1,497	1,130	902	16,157–25	17–55	1–35
Mann, J. W. ...	Tammin	1,497	1,130	609	10,755–0	17–40	1–34
Jenkins, R. M. ...	Corrigin	1,583	1,118	586	10,293–24	17–34	1–34
Bowron, L.	"Rockwell," Corrigin	1,583	1,118	590	10,390–0	17–20	1–33
Crossland, J. L. ...	Corrigin	1,583	1,118	990	17,053–31	17–13	1–32
Spillman, J. W. ...	Doodlakine ...	1,383	874	910	12,042–48	13–14	1–31
Howe, Bros. ...	Kulin	1,536	972	318	4,710–54	14–49	1–31
Browning, H. ...	Yandanooka ...	1,651	1,429	222	4,862–9	21–54	1–31
Laurence, H. N. ...	Ogilvie	1,532	1,265	502	9,467–18	18–52	1–30
Horsman, H. & Sons.	Corrigin	1,583	1,118	561	9,159–26	16–20	1–28
Gibbs, R. T. ...	Kellerberrin ...	1,548	1,107	352	5,641–1	16–2	1–27
Reynolds, A. G. ...	Mukinbudin ...	...	710	1,335	13,700–54	10–16	1–27
Inverarity, D. H. ...	Kellerberrin ...	1,548	1,107	548	8,633–0	15–45	1–25
Inzard, A.	Ogilvie	1,532	1,265	927	16,382–49	17–40	1–24
Fisher, A. G. ...	Doodlakine ...	1,383	874	591	7,477–55	12–39	1–23
Fulwood, C. ...	Corrigin	1,583	1,118	352	5,480–31	15–34	1–23
Dwyer, J.	"Ullaring," Southern Brook	1,490	1,196	590	9,669–0	16–23	1–22
Jewell, J. D. ...	Corrigin	1,583	1,118	602	9,181–21	15–15	1–22
Atkinson, A. G. ...	Ogilvie	1,532	1,265	597	9,839–39	16–29	1–18
Mableson, H. H. ...	Doodlakine ...	1,383	874	764	8,706–53	11–24	1–18
Cripp Bros.	Ogilvie	1,532	1,265	600	9,827–5	16–23	1–18
Horan, A. G. ...	Ogilvie	1,532	1,265	1,429	22,274–0	15–34	1–13
Gard, T.	Kukerin	2,186	1,394	320	5,135–12	16–3	1–13
Bahr, E. O. ...	Kukerin	2,186	1,394	337	5,312–14	15–46	1–8
Faulkner, W. J. ...	Kukerin	2,186	1,394	372	5,874–29	15–47	1–8
Michael, L. G. ...	Roundhill ...	2,054	1,656	302	5,172–0	15–24	1–5
English, J. C. ...	Kukerin	2,186	1,394	931	13,932–32	14–28	1–4
Sugg, M.	Kukerin	2,186	1,394	434	6,210–55	14–19	1–2

RAINFALL RECORDS FOR BATEMAN CUP.

District.	Jan.	Feb.	Mar.	Apl.	Useful Rains.							Nov.	Dec.	Total for Year.
					May.	Jne.	Jly.	Aug.	Sep.	Oct.	Total.			
Gnowangerup	33	135	12	32	303	309	123	123	150	79	1,087	282	32	1,613
Borden ...	19	119	23	39	198	261	99	106	159	119	942	330	104	1,576
Clare-Vale ...	65	48	85	12	241	328	181	122	35	10	917	107	*Nil*	1,234
Formby Siding	30	94	17	26	291	263	106	129	147	85	1,021	292	28	1,508
Ongerup ...	32	37	30	26	192	318	92	104	202	95	1,003	453	74	1,655
Clear Hills ...	7	136	11	43	306	289	86	81	129	74	965	*	*	*
Lake Grace ...	29	47	88	18	215	332	161	125	72	21	926	234	6	1,348
Koobabbie ...	1	215	10	*Nil*	373	333	131	78	10	50	975	55	9	1,265
Wolverden ...	2	91	4	3	435	335	114	159	29	10	1,082	108	*Nil*	1,236
Arnelup ...	6	64	30	63	219	312	128	113	188	107	1,067	567	54	1,851
Three Springs	*Nil*	62	11	*Nil*	330	409	124	147	25	20	1,055	108	*Nil*	1,236
Moulyinning...	25	56	70	20	260	307	124	103	123	65	982	319	9	1,481
Doodlakine ...	*Nil*	162	120	3	203	322	183	130	8	28	874	217	7	1,383
Tammin ...	4	132	104	11	283	412	252	121	30	32	1,130	110	6	1,497
Bruce Rock ...	*Nil*	55	114	7	253	312	216	120	21	41	963	223	3	1,365
Kellerberrin ...	3	116	140	5	277	368	278	101	38	45	1,107	173	4	1,548
Yandanooka...	*Nil*	58	25	7	415	536	205	207	48	18	1,429	131	1	1,651
Carnamah ...	26	113	22	8	352	425	214	121	35	24	1,171	118	*Nil*	1,458
Nungarin ...	4	144	87	8	279	249	104	86	14	55	787	225	*Nil*	1,255
Waddy Forest	*Nil*	197	12	3	307	320	148	92	30	56	953	64	*Nil*	1,229
Kulin... ...	36	26	134	40	240	371	190	122	24	25	972	327	1	1,536
Burracoppin...	19	181	113	5	409	277	93	68	24	65	936	358	4	1,616
Talgomine Downs	14	129	84	*Nil*	399	269	70	68	14	72	892	204	*Nil*	1,323
Corrigin ...	28	24	133	13	318	439	183	104	50	24	1,118	253	14	1,583
Ogilvie ...	*Nil*	45	188	*Nil*	472	410	119	165	47	52	1,265	34	*Nil*	1,532
Meckering ...	2	63	110	3	250	429	250	141	36	90	1,196	63	3	1,490
Mukinbudin ...	4	*	80	*Nil*	291	193	66	62	11	87	710	199	*Nil*	*
Kukerin ...	15	64	91	50	334	406	239	228	115	72	1,394	562	10	2,186
Round Hill ...	32	226	60	2	322	528	245	189	20	103	1,407	72	*Nil*	1,799
Shackleton ...	21	81	120	3	315	327	213	91	25	20	991	214	11	1,441

* Results not available.

Note—

Address.	Nearest Recording Station.	Address.	Nearest Recording Station.
Toompup	Ongerup	Southern Brook ...	Meckering
South Caroling ...	Clare Vale	Coorow	Koobabbie
Goomarin	Talgomine Downs	Indarra	Wolverden
Pallinup	Clear Hills		

It is gratifying to all concerned, and particularly to the donors of the valuable cup, that the competition created such widespread interest and terminated so successfully.

The total area harvested by the 87 competitors was 47,143 acres for a total yield of 875,217 bushels, and an average of 18 bushels 35 lbs. per acre.

The results of the competition are enhanced by the fact that they show two State official records created in our Centenary year.

Both records were made by the winner and are:—

1. The highest average yield per acre from the total stripped area (279 acres) on the farm, viz., 36 bushels 41 lbs. per acre. Previous records 31 bushels 39 lbs. (P. C. Neville, Yandanooka, Dist. Chall. Shield Wheat Yields Competition, 1928-29), and 26 bushels 56 lbs. (T. Richards, South Caroling, Wheat Yields Competition, 1925).

2. The highest average acre yield per inch of rainfall (1st May to 31st October inclusive), viz., 3 bushels 22 lbs. per acre per inch of rain which fell during the conventional growing period. Previous record 3 bushels 19 lbs.

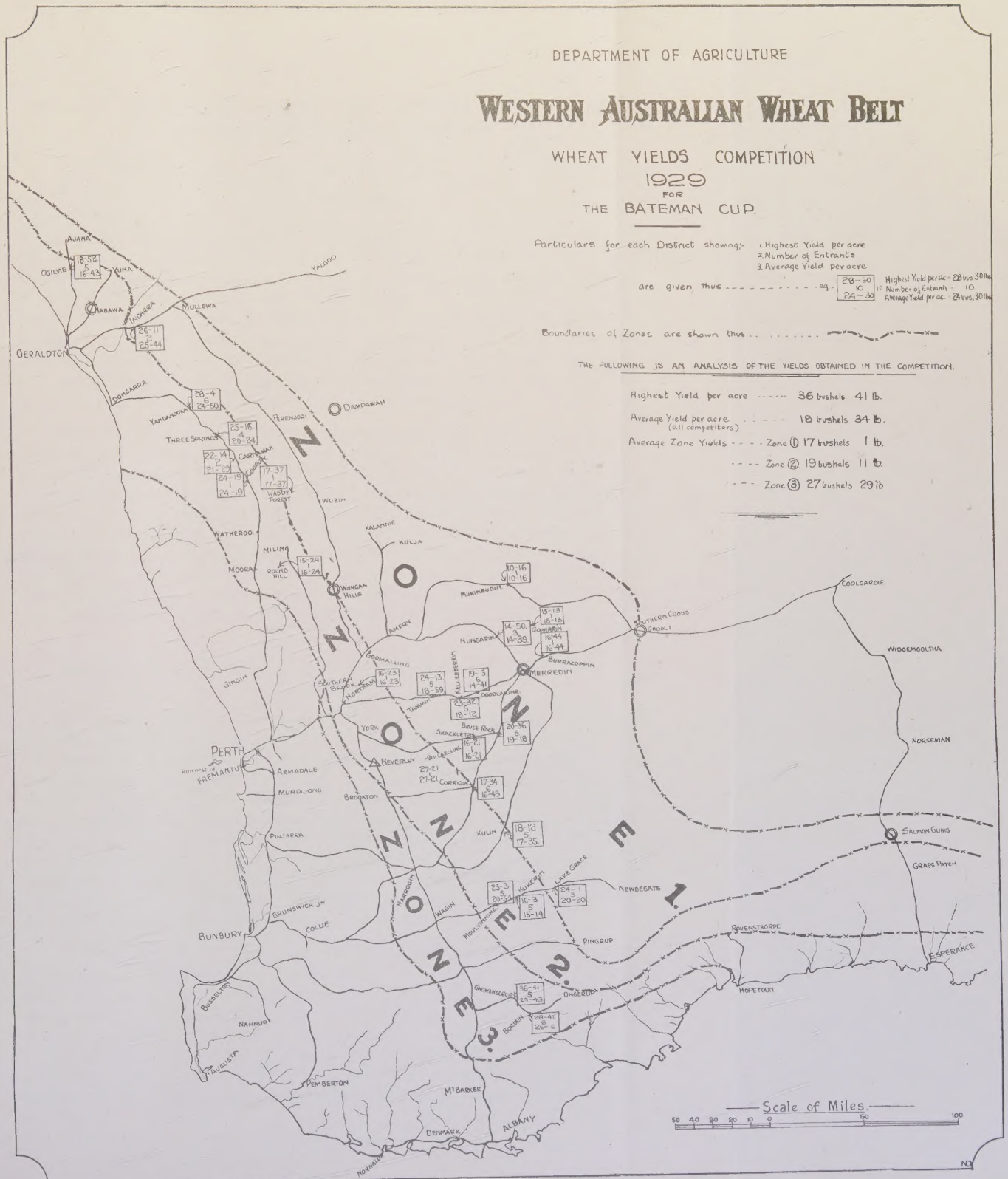
(T. Richards, South Caroling, Wheat Yields Competition, 1925, 801 pts. during growing period).

A special feature of this competition was the endeavour to eliminate the advantages due to climatic conditions. This, however, did not entirely eventuate because the rainfall (as disclosed by the records) favoured those competitors located in the Southern districts. The crops in these districts were benefited by the copious rains which were experienced throughout the wheat belt in November, which month is not included in the conventional growing period (1st May to 31st October). The seasonal rains began early in May and favourable conditions continued until the end of June. During July the rainfall was scanty, but no alarm was felt. The lack of rain in August, however, gave cause for anxiety. At the end of that month the crops showed signs of distress, and, as the adverse conditions continued during September, the position was viewed most seriously and it was feared that the season, which was more promising during the early part, would end with disastrous results. In October belated rains were experienced in some parts of the wheat belt. In the early districts where this rain fell it was too late to be of any use. In the Southern and other late districts, further late rains were experienced even as late as November.

The rainfall and other climatic conditions, which prevailed in some districts during September and October, and in others during July and August also, were such that the maturing of the crops was hastened, and in consequence, the November rains were too late to be of any benefit to them. In fact, in some cases, harvesting operations were about to commence at the time of these rains. Despite the advantages the winner and others gained by the beneficial rains late in the season, their performances are meritorious, but there are other competitors whose performances, in view of the scanty rainfall and other adverse climatic conditions prevailing during September, October, and in some cases also in August, are none the less praiseworthy.

Although adverse conditions prevailed throughout portion of the growing period, the excellent average yield of 18 bushels 34 lbs. was obtained. This is most encouraging and shows that sound farming methods are being practised and again emphatically indicates that the State average of 10 to 12 bushels is below what can be expected when sound farming methods are adopted.

The accompanying map of the W.A. Wheat Belt shows the locations of the competitors. The detailed figures for each district show the highest individual yield and the average yield for all competitors in that particular district.


DEPARTMENT OF AGRICULTURE
WESTERN AUSTRALIAN WHEAT BELT
WHEAT YIELDS COMPETITION
1929
FOR
THE BATEMAN CUP.
Particulars for each District showing:- 1. Highest Yield per acre
2. Number of Entrants
3. Average Yield per acre
are given thus ---------- eg. 28-30 / 10 / 24-39
Highest Yield per ac. = 28 bus 30 lbs
Number of Entrants = 10
Average Yield per ac. = 24 bus. 30 lbs
Boundaries of Zones are shown thus .. ..
THE FOLLOWING IS AN ANALYSIS OF THE YIELDS OBTAINED IN THE COMPETITION.
Highest Yield per acre ..... 36 bushels 41 lb.
Average Yield per acre (all competitors) ..... 18 bushels 34 lb.
Average Zone Yields - - - - Zone (1) 17 bushels 1 lb.
- - - - Zone (2) 19 bushels 11 lb.
- - - Zone (3) 27 bushels 29 lb.
ZONE 1.
ZONE 2.
ZONE 3.
Scale of Miles.
50 40 30 20 10 0 50 100
GERALDTON
AJANA
OSIUNE
YUNA
MABAWA
MULLEWA
YALGOO
DONGARRA
YANDANOOKA
THREE SPRINGS
CARNAMAH
DURAWAH
WARDA FOREST
DAMPAWAH
BERENJORI
WUBIN
KALANNIE
KULJA
WATHEROO
MILING
ROUND HILL
MOORA
NONGAN HILLS
MUKINBUDIN
AMERY
NUNGARIN
GOOMALLING
SOUTHERN CROSS
GOOMALI
COOLGARDIE
WIDGEMOOLTHA
NORSEMAN
MERREDIN
BURRACOPPIN
KELLERBERRIN
TAMMIN
DOODLAKINE
NORTHAM
SOUTHERN ROAD
GINGIN
YORK
BRUCE ROCK
SHACKLETON
PERTH
Connected to FREMANTLE
ARMADALE
MUNDIJONG
BROOKTON
BEVERLEY
CORRIGIN
PINJARRA
KUUN
SALMON GUMS
GRASS PATCH
NEWDEGATE
LAKE GRACE
KULIN
NARROGIN
WAGIN
BRUNSWICK JN
COLLIE
BUNBURY
MOUNTBARKER
PINGRUP
RAVENSTHORPE
ESPERANCE
HOPETOUN
GNOWANGERUP
ONGERUP
BORDEN
BASSENDEAN
NANNUP
AUGUSTA
PEMBERTON
MT BARKER
DENMARK
ALBANY
NORMALUP

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"BLACK SPOT" OR "SCAB" OF APPLES AND PEARS IN WESTERN AUSTRALIA.

H. A. Pittman, B.Sc. Agr.,
Plant Pathologist.

Although the disease known as "black spot" or "scab" of pears (caused by the fungus *Venturia pirina,* Aderh.) has been present in Western Australia for many years, and has, for the last decade or so, annually caused considerable reduction in the quantity and quality of the pear yields of very many of our orchards, the related disease on the apple (caused by *Venturia inaequalis,* (Cke.) Wint.), has, up till the present, been quite unknown. This fact, combined with the absence of codlin moth (*Laspeyresia pomonella,* L.), has made the life of the Western Australian apple grower, from a spraying point of view, at least, a particularly easy one.

Western Australian apples have always been noted, *inter alia,* for the clearness and brightness of their skins; and this desirable brightness, absence of surface blemishes due to "scab" or codlin moth, greater nearness to the market, and greater average maturity at picking time of Western Australia's fruit in contrast to that from some of the other Australian States (2), have all contributed to establish our apples in a particularly high place in the estimation of English and Continental buyers. It is very fervently to be hoped that this state of affairs will long continue, but, with the outbreak of "apple scab" within our borders, a rather serious blow may well have been struck at the easy continuance of the high standard of excellence of much of our apple crop.

HISTORY OF "BLACK SPOT" OF APPLES IN WESTERN AUSTRALIA.

In 1902 McAlpine (8), writing on "Black Spot of the Apple" stated,—"It has made its appearance in all the Australian States and seems to thrive well where the climate is neither too hot nor too dry." By implication, therefore, McAlpine stated that "black spot" was present in Western Australia as early, at least, as 1902. Whether he was guilty of too hasty a generalization, or whether the disease actually was present here at that time and later on died out, we at present have no reliable means of telling. Certain it is that the disease has not been known to officers of this Department, during all the years apples have been grown in Western Australia, until April of the present year, and until then not a single apple tree in the whole State had ever been sprayed, to the Department's knowledge, for its control.

In 1925, Mr. W. M. Carne, at that time Economic Botanist and Plant Pathologist to this Department, writing on "A Preliminary Census of the Plant Diseases of South-Western Australia" (1), made the following interesting remarks in connection with certain previous records of fungi in Western Australia published in the writings of various authors, including McAlpine, viz.:—"The writer has considered it advisable to omit some of the references therein given, while others have been somewhat doubtfully included. *These remarks apply to important diseases of economic plants which*

are unknown to the field officers of this Department and to the writer. If they do occur they are certainly not of economic importance in this State. Such diseases include Apple Scab (Venturia inaequalis) . . ."*

On page 32 of the Empire Marketing Board Special Report No. 3, 1928, occurs the following statement under the heading "*Venturia inaequalis*—Scab or Black Spot":—"Fruit showing signs of scab injury was not observed until half-way through the season, when it was first noticed on Tasmanian Sturmer Pippin apples. *Later it was seen on Western Australian fruit.*"*

This statement led to a communication on the matter dated 5th June, 1928, by Mr. Carne to the Secretary of the Empire Marketing Board, in which it was pointed out that the disease was not known by Departmental

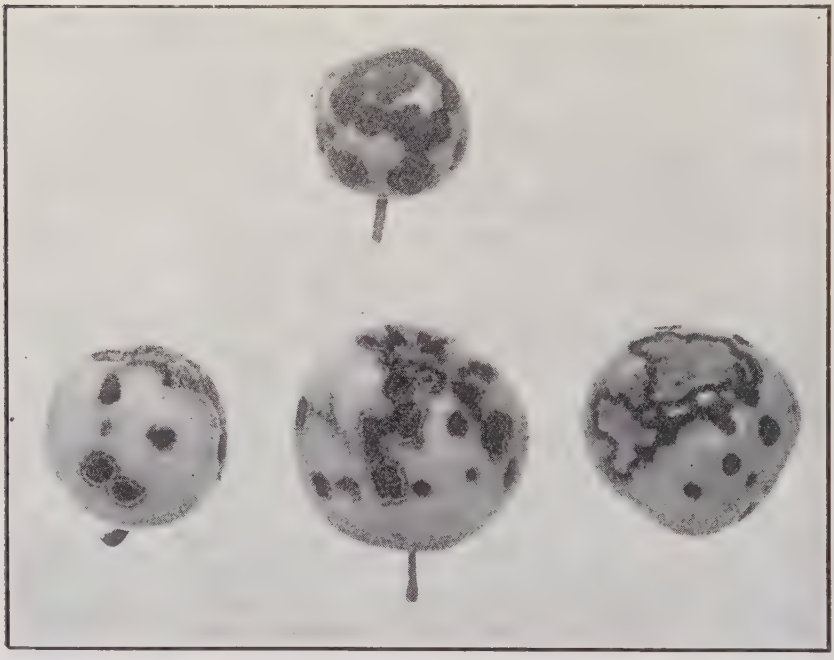

Fig. 1.—Cleopatra apples from Manjimup badly affected with "Black Spot" or "Scab" due to *Venturia inaequalis*.

Photo. by Author.

officers to be present in Western Australia, but that full details of the fruit concerned would be welcomed so that the orchard and the trees affected could be located. The Secretary, in reply, regretted that the particular information required could not be supplied, as the apples in question had been examined by a mycologist no longer in the service of the Board, and it had been impossible, in the absence of his personal notebooks, to trace the name of the grower or growers concerned.

On 4th April of this year a small number of Cleopatra apples badly affected with *Venturia inaequalis* (see Fig. 1) were brought to this office by

* The italics are mine.—H.A.P.

Mr. J. Ramage, of Paterson & Co., Perth, from Manjimup, this constituting the first unquestionable record of the disease in Western Australia. The fungus was in a very active condition, each of the lesions being covered with thousands of the very typical, greenish-brown, spores of the *Fusicladium* stage. (See Fig. 4.) A visit to the district by the Director of Agriculture (Mr. G. L. Sutton), the Superintendent of Horticulture (Mr. G. W. Wickens), and the writer, on 8th April, revealed that the fruits on about a dozen Cleopatra trees, well inside the boundaries of a single orchard, were seriously affected; several smaller lesions being also found on a few Granny Smith fruits, and numerous, newly-formed, lesions on the leaves of a large number of trees of various varieties in the vicinity of the badly-affected ones. No other orchards in the district were found to be affected, but on 29th April a number of Granny Smith apples from an orchard at the Porongorups, about 100 miles away, were also received at this office, and found to be affected with the *Fusicladium* stage of the scab fungus. In both instances rigorous spraying and other measures were immediately taken in an attempt to wipe out the disease, and every effort is now being made by the Superintendent of Horticulture and his staff of Orchard Inspectors to determine if other orchards are affected, so that further measures appropriate to the situation may be at once instituted. In view of the fact that the majority of the young apple trees for planting in Western Australian orchards have always been obtained from Victoria, in which State the disease has long been serious and widespread, it is rather surprising that the apple-growing industry of this State has for so long remained free of this disease, which is held by many authorities to be, perhaps, the most serious of all apple troubles.

In view of the comparative dryness of the summer conditions of the main apple-growing districts in Western Australia, the disease, should it prove to be impossible of eradication, will probably never be as serious here as in, say, Victoria and Tasmania, where the summer humidity is, on the whole, much greater than in our main apple-growing districts. Nevertheless, as can be seen from the photographs of affected apples from Manjimup (Fig. 1) and the Porongorups (Fig. 2), the disease, when uncontrolled, is capable of causing very considerable damage. It therefore behoves all growers to be on the watch for the first sign of the trouble on their properties, and then immediately to take all the necessary steps to control the disease and prevent it ever reaching a serious condition. As a matter of fact, preventive measures in the form of spraying, etc., would seem very well worth while in the case of orchardists situated at all close to the two present places of outbreak.

This article is written with the chief object of calling attention to the seriousness of the disease, the symptoms by which it may be recognised, and the control measures, by which, if they are conscientiously carried out, the disease, which is quite a controllable one, can be prevented from ever seriously detracting from the quality or quantity of the great bulk of Western Australia's apple crop.

DISTRIBUTION AND ECONOMIC IMPORTANCE OF APPLE "SCAB" OR "BLACK SPOT."

"Black spot" or "scab" of apples has now been recorded from all the States of the Commonwealth. It occurs also in England, on the Continent wherever apples are grown, in North America, South Africa, and New

Zealand. Indeed, its distribution seems to be almost as wide as apple culture, a fact which is not surprising, if the contention of certain writers, that it occurred on the wild parents of the apple, be true. Wherever it occurs it

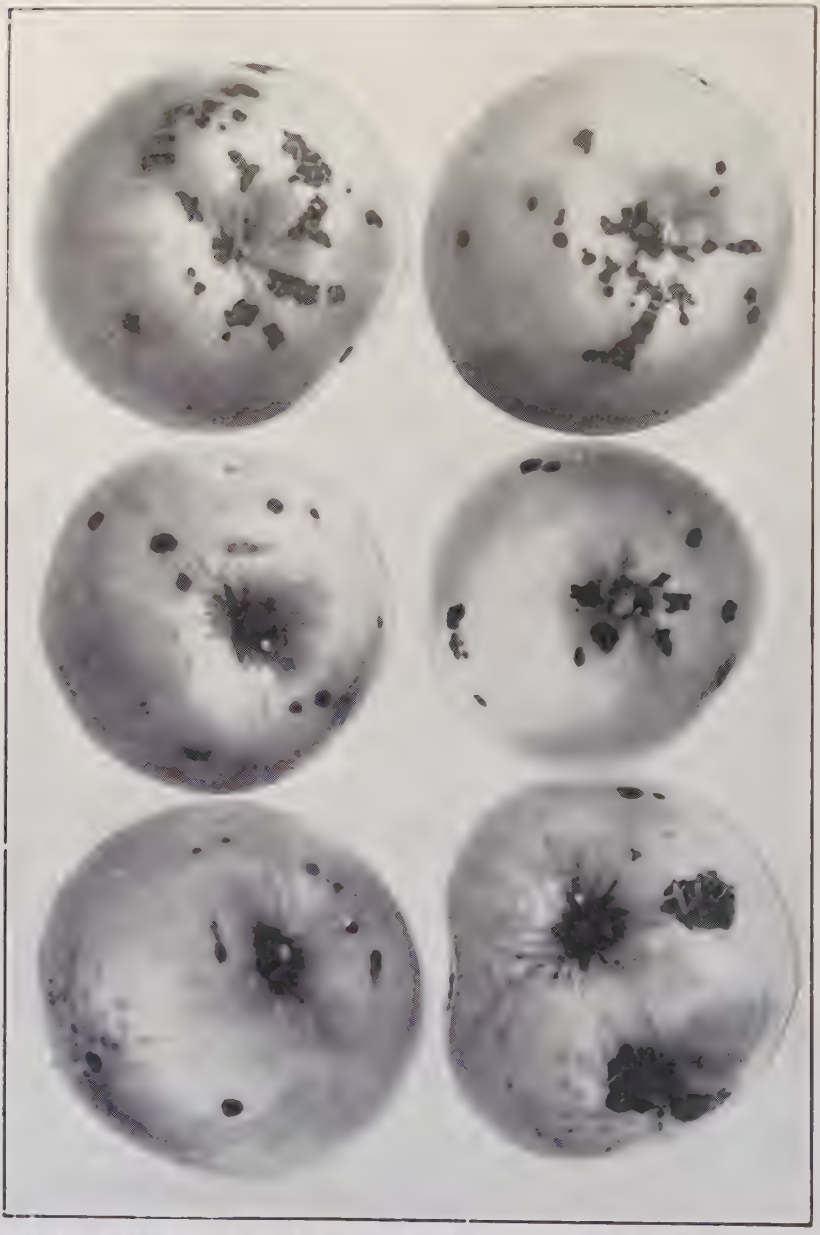

Fig. 2.—Granny Smith apples from the Pureagurnga affected with "Black Spot" or "Scab" due to *Venturia inaequalis*. The small size of many of the lesions is due to the fact that much of the infection occurred when the apples were almost fully grown, and only a short time before the photograph was taken.

Photo. by Author.

is much more serious in cool, moist climates than where the spring and summer climate is usually hot and dry, although even there it may do enormous damage in the occasional seasons favourable to its development.

Heald (7) states that in the United States of America the annual loss, even on the most conservative estimate, runs into millions of dollars, and that in Australia the average annual loss per acre has been estimated at nearly £10. In the State of Montana in U.S.A., in the years 1911 and 1912 the disease caused a loss of 15 per cent. of the crop. These few figures will indicate that the disease is not to be lightly regarded. It is, indeed, by many authorities considered the most serious apple trouble. Cunningham, for example (3), in referring to the economic importance of the disease in New Zealand, states that, "Black spot is the most serious apple disease with which the orchardist has to contend, as it not only weakens the tree by damaging the leaves, but reduces the market value of the fruit through the development of disfiguring spots, scabs, and cracks on the epidermis (skin). In cases of severe infection the crop may become a total loss, owing to the developing fruits being so damaged as to fall to the ground at the time of setting or

Fig. 3.—*Left*—Rome Beauty apple leaf showing early stage of infection with the "black spot" fungus. *Right*—An old Jonathan leaf carrying winter spores (*ascospores*) of the "black spot" fungus in *perithecia* embedded in the dead tissues.

After J. Farrell, Vict. Journ. Agric., 1919.

shortly after. As a result of fruit infection loss may be caused in four ways:—(1) The fruits may fail to set owing to being killed outright by the fungus; (2) young fruits may fall to the ground; (3) fruits may become distorted, badly scabbed, or cracked, and thus be rendered unsaleable; (4) the quality of the fruit and its keeping properties may become impaired by the development of disfiguring marks on the surface."

"In the last case the disease does not result in the rotting or breaking down of the tissue of the apple, as is the case with bitter-rot and other similar fruit-rotting fungi. On the contrary, the most noticeable effect may be a mere superficial disfigurement of otherwise mature and healthy fruit; nevertheless, this defect in quality is often enough in itself to render a large

portion of a crop unsaleable. Serious as this may be, it is by no means the worst feature of black spot; in several ways it may directly reduce the *quantity* of fruit. This aspect of the disease is more liable to pass unnoticed, but it is immeasurably more disastrous in its results. Black spot thus affects the quantity as well as the quality of the output—the two factors on which the profit of the orchardist depends."

LIFE HISTORY OF THE APPLE "SCAB" ORGANISM, AND ITS EFFECTS ON APPLE LEAVES, SHOOTS, AND FRUITS.

"Black Spot" or "Apple Scab" is caused by a fungus known scientifically, in the sexual or perfect stage, as *Venturia inaequalis*, (Cooke) Winter, and in the non-sexual condition as *Fusicladium dendriticum*, (Wal.) Fcl. The disease is carried over from year to year almost entirely by means of infected leaves, which, on falling to the ground in the autumn, harbour the fungus within their dead tissues, and in doing so provide it with the nourishment required to produce large quantities of fungus seed-bodies, or *spores*, during the winter months. These spores (called *ascospores*) are produced in thick-walled, flask-like, fungal-structures known as *perithecia*, each of which, as indicated in Figure 6, lies snugly buried in the tissues of a dead leaf. These *perithecia*, which are each only about the diameter of a "full stop" on this page, (9) are gradually formed by the fungus during the passage of the winter months, and a very large number may be formed within the tissues of a single leaf. (Fig. 3.) Each *perithecium* eventually comes to contain many thousands of spores, each spore being produced, along with seven others, in a little sac-like envelope known as an *ascus* (see Fig. 4). Each spore or fungus seed-body is divided into two compartments, or *cells*, of which the top one is somewhat shorter, but broader near the base, than the other. Now the time taken for the production and maturation of these *ascospores* is such that, given normal climatic conditions, the *ascospores* are just about ready to be set free to fend for themselves, and restart the disease, at the very time that the apple trees are bursting forth into leaf and blossom. When, then, the mature *perithecia*, in the dead leaves on the ground below the trees, become thoroughly moistened by the occurrence of a shower of rain, or in any other manner, "the *perithecia* and certain portions of the *asci* swell to such an extent that the enclosed *asci* are subjected to considerable pressure, thus forcing out their contained *ascospores* through the *perithecia*, into the air. So great is the pressure developed by the swelling of these hygroscopic (water-absorbing) portions that the entire *perithecium* sometimes is shattered, *asci* and *spores* being ejected into the air with considerable force, the embedded base of the *perithecium* alone remaining in the leaf-tissues. Not only is abundant moisture essential for the discharge of the *ascospores*, but it must also be present on the leaves before an *ascospore* can germinate or its *infection-hypha* ("fungus-root") pierce the cuticle (*i.e.*, the transparent rubber-like covering of the skin of fruit, blossom, shoot, or leaf)." (3.)

On germination each cell of an *ascospore* produces a narrow fungal tube called a *germ-tube* (or *infection-hypha*), which is capable of infecting the surface of a leaf, blossom, fruit, or young twig whenever the proper conditions prevail (10). "Considerable moisture in the form of rain or heavy fogs is a requisite for spore germination and infection. In general, cool, wet weather is conducive to the germination of the spores and infection of the host. On the other hand, hot, dry weather is unfavourable for the

spread of the disease. If very dry weather prevails for a few weeks during the time of blossoming and unfolding of the leaves, there is little opportunity for the primary ascospore infections to occur, and there will be few conidia (spores produced during the growing period) for secondary infection." (Owens, 1928) (10).

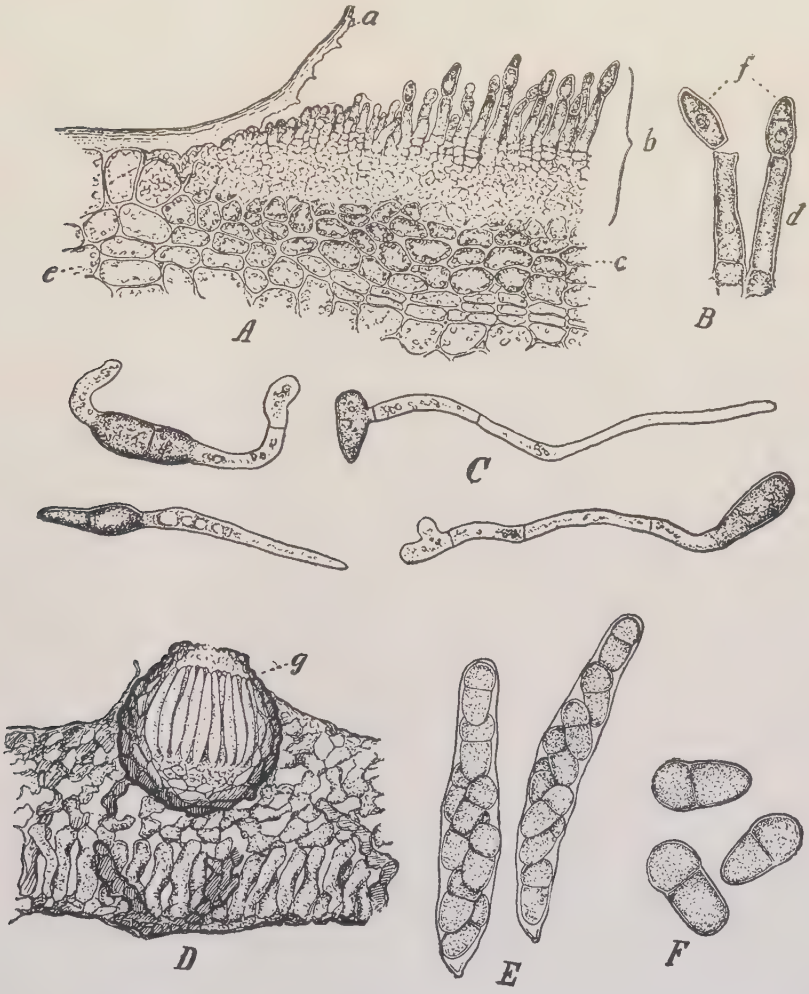

Fig. 4.—Stages in the life history of the "apple scab" fungus, *Venturia inaequalis*:—

A. Portion of a section through a "scab" spot on an apple fruit, showing the fungus forcing up the cuticle of the epidermal cells and producing a number of greenish-brown *conidia*.

B. Two spore-producing structures (*conidiophores*) with a *conidium* at the tip of each.

C. Four *conidia* in the process of germination.

D. Section of a dead apple leaf showing a *perithecium* of *Venturia inaequalis* embedded in the tissues.

E. Two *asci* with *ascospores* inside.

F. *Ascospores*. (After Longyear, from Stevens' "The Fungi which cause Plant Disease.")

From the primary infections caused in the spring by the *ascospores*, subsequent infections may be brought about during the remainder of the season by means of a special type of spore known as a *conidium* (plural *conidia*) (see Fig. 4). These *conidia* may be formed, after the passage of several weeks time, in enormous numbers on any tissue infected by the fungus. When seen under the microscope they are greenish-brown in colour, somewhat tooth-shaped (being broader at one end than the other), and sometimes divided by a transverse wall into two separate cells. (Fig. 4.) They may be carried away by wind, or rain, to other leaves, flowers, fruits or shoots, on which, in the presence of abundant moisture, they may germinate, as indicated in Fig. 4, within a few hours of becoming mature. By means of a germ-tube they may then penetrate the cuticle and give rise to further lesions. In mass, the *conidia*, which constitute the only type of spores produced on living tissues, appear black, and thus give the intense and characteristic blackish colour to infected areas on leaves, blossoms, fruits or shoots, when in the spore-producing condition (Figs. 1, 2, 3, 5, 7, and 9). It is this conidial stage of the fungus which is known as *Fusicladium dendriticum*; the perfect or sexual stage, produced in the tissues of dead leaves, being the *Venturia* form of the organism.

EFFECTS OF THE "APPLE SCAB" FUNGUS ON LEAVES, BLOSSOMS, FRUITS, AND SHOOTS.

Symptoms of "scab" upon the *leaves* may be of two distinct types. The more common type takes the form, when young, of more or less circular, greenish-brown, or greyish-green spots with a very much branched and tree-like structure, readily discernible under a lens, at the margins. Later in the season, the spots, under favourable conditions, may produce large numbers of spores, and in this condition they appear olive-green or almost black (Figs. 3 and 5). As the spots become larger they often blister up, and the dark, velvety surface then becomes smoother, duller, or sometimes shining and graphite-like in colour, as the spores are rubbed, washed, or blown away.

In the other type of leaf infection the fungus spreads in a very diffuse, or indefinitely-outlined, manner, over the tissue of the leaves, giving somewhat the impression of a kind of sooty-mould, although the fungus is really below the cuticle and not above it as in the latter case. This type of lesion is most common on the bottom sides of the leaves, and tends to follow along the direction of the main veins.

Both these forms were seen by the author in the case of the outbreak at Manjimup reported above. "When the scab spots are abundant or when the diffuse form is severe there may be more or less reduction in the size of the leaves with curling and distortion. In the severe diffuse type much leaf tissue is killed and the affected leaves or portions of them may appear as if scorched or burned . . . The diseased areas may appear on either surface of the leaves, but the earliest infections are most frequently upon the lower surfaces"—(Heald, 1926) (7).

On the *fruits* the scab lesions first become obvious as small, brownish or black, irregular or circular spots without any break in the skin. With increase in the size of the lesions the *cuticle*, or transparent rubber-like coating over the first layer of cells, becomes ruptured (see Figs. 4 and 7), and the interior of the lesion then appears velvety and dark brown, or almost black, with an irregular and considerably frayed and torn, silvery-white,

margin, which is the ruptured cuticle. This silvery-white and much lacerated cuticle can often be seen in the early stages with the naked eye, but it is, of course, much more readily distinguished with a hand lens. Under the lens the centres of newly-formed, smallish lesions, often have a mottled silvery-white and black appearance, due to the alternation of black patches of spores and pieces of ruptured cuticle. Many of the fruits infected in the early stages (see Fig. 8) fall to the ground, but large numbers may persist on the trees. In such a case many of the infected apples will become badly dis-

Fig. 5.—"Black spot" or "apple scab" lesions on apple leaf.
After Mason, "Spraying, Dusting and Fumigating of Plants."

torted (Figs. 1 and 8), owing to the more rapid rate of growth on the part of the healthy portions giving an unsymmetrical development. With increase in the size of the fruits and the lesions, the centre parts of the diseased areas often become bare, corky, and somewhat cracked or fissured, the edges of each lesion still, however, remaining infected and dark in colour, owing to the continual production of spores (Fig. 9). It is this phase of the disease which has given rise to the common name "apple scab." Once the centre of a fruit lesion has become hard and corky, any further increase in the growth of the

still healthy portions of the fruit may lead to the development of very large and unsightly cracks in the diseased area (Fig. 8). When fully-grown, or almost fully-grown fruits are infected very late in the season, the lesions usually remain small, and the centres rarely become bare and corky. (Figs 2 and 9). If apples recently infected with the scab fungus, or bearing *conidia* on their surfaces, are placed into cool or open storage, lesions may develop in the store.

In the case of *blossom* infection, lesions may appear on the flower-stalks (*pedicels*), petals, calyces, or young fruits. The lesions may be many and small, or of a diffuse and spreading nature. As a result of blossom infection there may be very considerable reduction in the amount of fruit set, besides great reduction in the quality of much that persists.

"Scab" lesions on the *twigs* are stated to be confined to the bark of one-year old shoots (Heald, 1926) (7). "Young lesions on the twigs are very similar in appearance to those on the fruits, showing the central spore surface bordered by the unlifted epidermis (skin). Later in the season, the spores may disappear and the bark show a more scaly character, due to the peeling of the bark in flakes. . . . The twig lesions may be few and scattered, and thus may be easily overlooked, or they may be so numerous as to coalesce and produce more extended affected areas" (7). The lesions on the shoots may play a part in carrying the disease over from season to season, where the winter conditions are mild, as they may, under such conditions, produce a fresh crop of *conidia* in the following spring.

VARIETIES AFFECTED.

So far, only "Cleopatra" and "Granny Smith" apples have been found affected in Western Australia. Thomas (11) in Tasmania in 1925, stated that, "In general, the least susceptible varieties are those that blossom late in the season, such as London Pippin (Five Crown), Worcester Pearmain, Winter Majetin, and Geeveston Fanny, whilst amongst the worst affected varieties are Cleopatra, Scarlet Pearmain, and Delicious."

Darnell-Smith and Mackinnon (5) in New South Wales in 1915 gave lists as follows:—"Among those that appear *susceptible* are:—Ben Davis, Cleopatra, Delicious, Esopus Spitzenburg, Gravenstein, Irish Peach, Maiden's Blush, McIntosh Red, Dunn's (Munroe's) Favourite. Newtown Pippin, Northern Spy, Pomme de Neige (Fameuse or Lady of the Snows), Ribston Pippin, Rokewood, Scarlet Nonpareil, Stone Pippin, Sturmer Pippin, Twenty Ounce, Winesap, Winter Pearmain, and Yates."

"Those apparently *least affected* are:—Alexander, Baldwin, Cox's Orange Pippin, Duchess d'Oldenburg, London Pippin (Five Crown), Grimes, Hoover, Jonathan, Reinette de Canada, Rome Beauty, Rymer, Statesman, and Wealthy."

I have been unable, in the time available before going to press, to locate any later Australian lists.

"BLACK SPOT" OR "SCAB" OF PEARS.

The disease known as "black spot" or "scab" of pears (Fig. 11) has been present in Western Australia for many years, and has annually caused considerable reduction in the quantity and quality of the yield in many orchards. So serious has been the loss caused by the disease to many growers in the

Albany, Mount Barker and Bridgetown districts, for example, of recent years, that many have spoken quite seriously of uprooting their pear trees if a better state of affairs does not soon prevail. It may as well be stated, here and now, that there is no need to go to any such extreme lengths, or to take such a pessimistic view of the situation, as "pear scab," like "apple scab," is a readily controllable disease, if the growers will only tackle the job in a determined and aggressive way and go the right way about it. Control

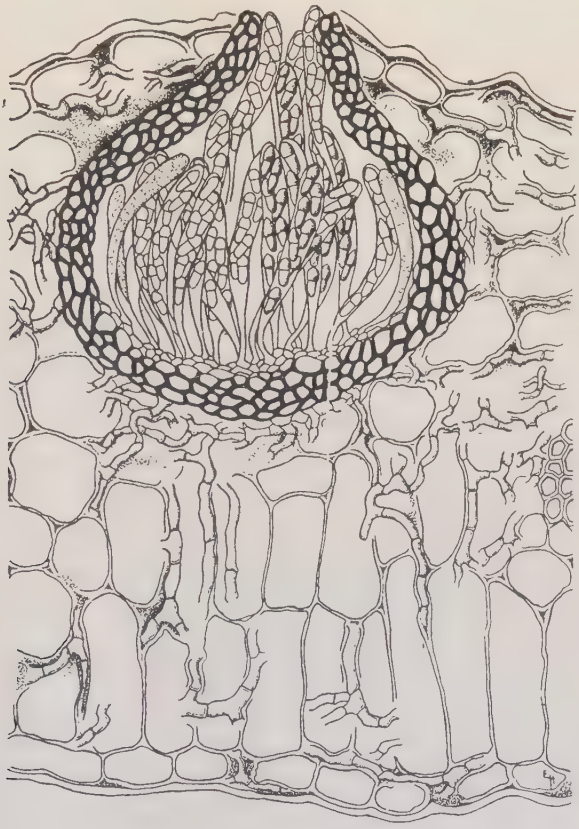

Fig. 6.—*Venturia inaequalis* on apple leaf. Section through a *perithecium* embedded in a dead leaf, showing the *asci* and *ascospores*. *After the drawing by Elsa O. Horn in Owen's "Principles of Plant Pathology."*

measures are given below, which, if conscientiously carried out, will, in the future, undoubtedly reduce the present dominion, pomp, and power of the pear scab fungus, to a mere vestige of its former glory and exalted condition. The very indifferent control of "black spot" or "scab" of pears which many growers have obtained in the past, has been due, to some extent, at least, to the fact that most of our pear growers are, really, to a much greater extent, growers of apples, and as the *pear* fungus does not attack the *apple* trees or fruits, many growers have tended to rely more and more on their apples to return them cheques, and have let the pears "slide." A further contributing factor to the poor control of pear "scab" in many orchards has been the

fact that only *one* spraying, and not a single other control measure, has been invoked in the fight against the pest. Now, although certain growers, for example Orchard Inspector Flintoff at Bridgetown, have obtained very satisfactory control of pear "scab" with only one spraying of Bordeaux Mixture, 6-6-50 strength, at the "pinking stage," other growers, and I have in mind particularly certain orchardists at Mount Barker, have decidedly not done so, even though they have, as they themselves put it, figuratively "slept under the trees to closely observe the development of the buds and blossoms, and spray exactly at the right time." *The life-history of the "pear scab" fungus (Venturia pirina, Aderh. = Fusicladium pirinum, (Lib.) Fcl.) is identical in all its*

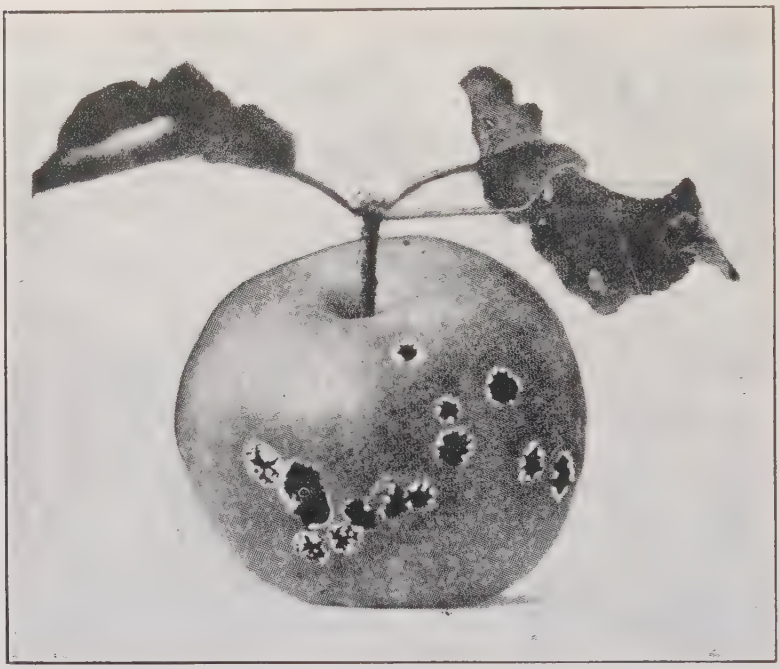

Fig. 7.—"Black Spot" or "Scab" of apple due to *Venturia inaequalis*, showing the silvery-white broken cuticle at the margin of the lesions. *After Craig (from Stevens' "Diseases of Economic Plants").* (Somewhat modified.)

main features with that of the "apple scab" fungus already dealt with. The two fungi are, however, although closely related, quite distinct, and the pear fungus cannot attack the apple, or the apple fungus the pear. The only other important difference is that while infection of the shoots in the case of the apple is comparatively rare, in the case of the pear, shoot infection is much more frequent, and therefore much more important as a contributing factor in carrying the disease over from year to year. "The fact must not be lost sight of, however, that *perithecia* are produced abundantly on fallen leaves, and that *ascospores* produced therein infect the leaves and fruits of the pear in the spring." (Cunningham, 1925) (3.)

CONTROL OF THE "BLACK SPOT" OR "SCAB" DISEASES OF APPLE AND PEAR. GENERAL CONSIDERATIONS.

As both the apple and pear "scab" organisms are so closely related, and their life-histories so similar, the control measures to be taken for each are, of necessity, except for slight differences in detail, identical.

In each case the main reliance must be placed on systematic, routine spraying, but certain auxiliary practices will, when intelligently carried out, assist materially to reduce each of these diseases to comparatively negligible amounts.

The harm done to any phase of rural industry by such diseases as apple and pear "scab" is usually not attributable to any lack of suitable control measures, but to the fact that, in many cases, only a small proportion of the growers can be induced to carry them out efficiently; and in this, rather than in the actual outbreak of apple "scab" itself, for example, lies the only serious menace to the continued high standard of our apple-growing industry, should the disease succeed in exceeding the geographic limits to which, at present, it appears to be confined. Apple "scab" need hold no terrors for the fruit growers of Western Australia, if it is only intelligently and aggressively combatted. Western Australia has, indeed, been singularly fortunate to have remained for so long free from this disease, which, as stated above, is practically world-wide in its distribution and occurs almost everywhere apples are grown. In all the other Australian States, for example, the disease has been known since, at least, 1895, and in Victoria it was recorded as early as 1862 (8), and has been more or less satisfactorily contended with by apple growers ever since. The dry summer climate of much of our apple-growing territory will alone do much to prevent the disease ever assuming overwhelming proportions, and the control measures indicated below should reduce it to a comparatively negligible amount.

Owing to the widely scattered nature of many of our apple-growing districts it is not to be expected that apple growers will take spraying measures against the disease until it actually appears on their individual properties, except in the case of orchardists in the immediate vicinity of the two present outbreaks, but all should be on the watch for the trouble, *and then at the first sign of infection immediately notify this Department and take such steps as may be appropriate to the time of the year, extent of the outbreak, and so on, to prevent the disease ever getting a firm hold. The importance of this last point cannot be too strongly emphasised.*

Growers on whose properties apple "scab" is not yet present should do everything possible to prevent the disease entering their boundaries, by refusing to permit relations, members of their families, etc., to bring apples from other orchards or shops on to their properties. If it is necessary to obtain bud-wood, young trees, etc., from any other orchardist, care should be taken to first ascertain that the other orchard is, so far as can be ascertained at the time, quite free of the disease. In spite of all these precautions, however, the disease may be introduced, as the spores may be carried long distances by wind.

DETAILS OF CONTROL MEASURES FOR "BLACK SPOT" OR "SCAB" OF APPLE OR PEAR.

1. Where the disease is bad, after the fruit has been gathered in the autumn, and before the time when the majority of the leaves normally fall from the trees, give a good spraying with Bordeaux Mixture, 5-4-50.

There is often a renewed activity on the part of the fungus in the autumn when the cool, damp, or dewy weather starts (as at Manjimup and the Porongorups this year), and a good spraying at this time of the season will prevent infection of many still healthy leaves, and will therefore greatly reduce the numbers of *ascospores* to be contended with in the following spring. Any fallen leaves below the trees should also be sprayed.

2. As soon as practicable in the autumn, plough the fallen leaves under the surface, setting the plough to bury them as deeply as possible without unduly injuring the root systems of the trees. Where the plough cannot reach, have the leaves either raked up and burnt, or deeply dug under. The idea of this is to cause as many leaves as possible to rot away before the spring, and to secure that many others shall remain buried when the necessary cultivation is given at that time. The object of burying the leaves as early as possible is that the *warmer* the soil when the operation is carried out, the more complete will be the rotting away of the leaves under the influence of various soil organisms before the spring cultivation. It is very certain that if every fallen leaf could be raked up and burnt in the autumn, there would be very little need for spraying or any other measures to control apple "scab," owing to the fact, already reiterated several times, that apple "scab" is almost entirely carried over from the autumn to the following spring in the dead apple leaves. The same holds true, although to a somewhat lesser extent, in the case of "scab" of the pear. In practice it is impossible to rake up and destroy every leaf, so that the best that can be done is to bury the leaves as deeply as possible in the autumn, and then to set the plough or cultivator to work several inches shallower in the spring, so as to avoid an unduly large number of unrotted leaves coming to the surface at that time. (As a matter of general orchard practice a cover crop should, of course, be grown during the winter, to enrich the soil later on when ploughed in.)

3. When carrying out the summer or winter pruning operations keep a careful lookout for lesions on the wood. Newly-formed lesions will only be found on new or one-year-old shoots. Shoot lesions are much more common on the pear than the apple. Prune out affected parts and burn. In this way one of the sources of carry-over from season to season will be removed.

Details of the spraying programme to be adopted during the spring and summer period are given below.

SPRING AND SUMMER SPRAYING PROGRAMME.

In addition to the above control measures:—

1. Spray the trees at the "delayed dormant," "green-tip," or "spur-bursting" stage (Fig. 10) with Bordeaux mixture, 5-4-50, or Lime Sulphur 1-15, to combat the *ascospores* which will, by that time, in a normal season, be emerging from the dead leaves on the ground. As stated in the section on "Life History of the Fungus" it is the *ascospores* formed in the dead

leaves on the ground that constitute the most important means (in the apple, at least) of carrying the disease over from season to season, and these must

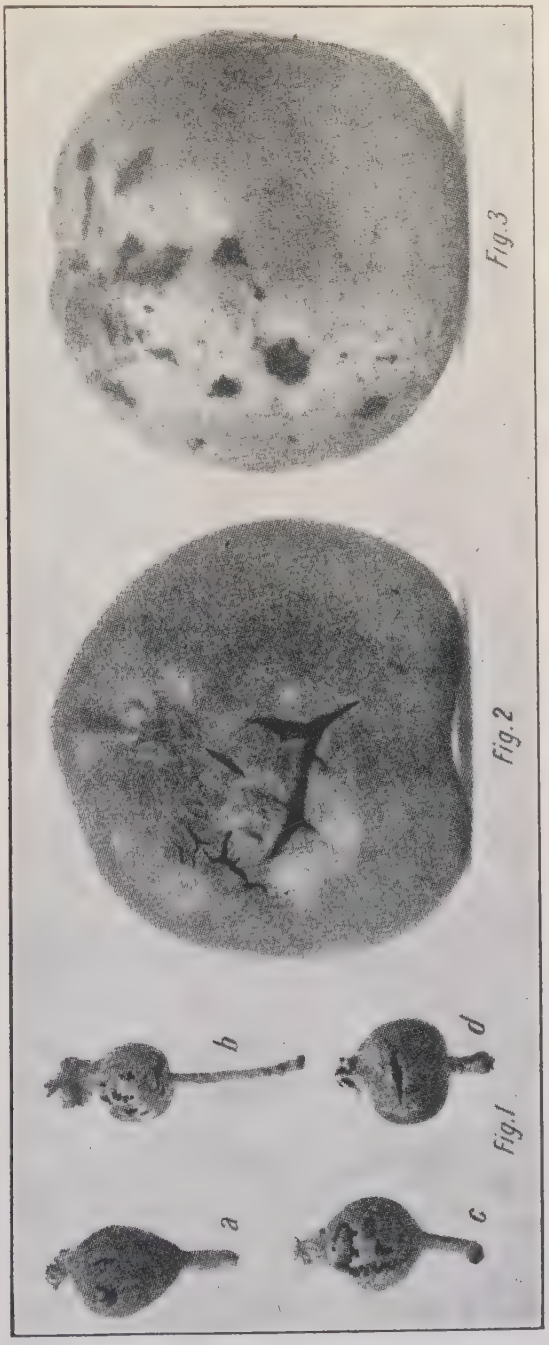

Fig. 8.—*Left*—Four young apples showing early infection with "black spot" or "scab" due to *Venturia inaequalis*, *Centre*—Apple infected at fairly early stage with "black spot" or "scab," showing the very marked distortion and cracking which frequently eventuates in such cases as the apple grows larger. *Right*—Apple infected with "black spot" at a late stage in its life, showing the relatively small lesions formed under such circumstances.
After J. Farrell, Vict. Journ. Agric., 1919.

be prevented from attacking the young leaves, blossoms, and shoots as they develop in the spring. When spraying, spray not only the tree, but the

ground below and about also, as, in this way, many of the *ascospores* formed in the dead leaves are killed without ever reaching the tree (Curtis, 1924) (4).

2. Spray the trees, and the ground beneath and around the trees at, or between, the "pre-pink" ("open cluster") and "pink" stages (Fig. 10) with Bordeaux mixture 3-4-50, or Lime-Sulphur 1-35 to 40 for apples, and 1-35 for pears.

Under some climatic conditions, *i.e.,* where the spring is cool and very moist, two separate sprayings, one at the "pre-pink," and another at the "pink" stage are recommended at the above strengths, but provided that the "delayed dormant" spraying has been given (and the importance of this cannot be too strongly emphasized), only one spraying during this period should be required under Western Australian conditions. *The grower should note carefully that the second spraying is considerably weaker than the first. In the case of apples sprayed with Bordeaux mixture this point is exceedingly important,* as although Bordeaux is a better spray than lime-sulphur for controlling "black spot" or "scab," it is very likely to russet the apple fruits if used only a little too strong at this, or the next stage. To minimize the danger, a nozzle throwing only a very fine mist should be used at these stages, and although the spraying should be thoroughly done, every part of the tree receiving its share, every attempt should be made to use just a little too little, rather than a little too much. Never hold the spray nozzle for any length of time in the same place so that the spray runs like rain off the leaves, blossoms and twigs; the aim should always be to put just so much spray on the plant that it will dry down without causing any appreciable drip from the tree after the operator has left it. *In this connection the use of a spray spreader such as calcium caseinate at the rate of half to one pound per 50 gallons of spray—whether Bordeaux or Lime-sulphur—is very strongly recommended.* This matter is referred to at greater length below. It is also important to remember that Bordeaux is much more likely to cause russetting on apples if applied during cool, moist weather, than if the weather is warm and dry at the time of application. 3-4-50 Bordeaux has no appreciable russetting effects on pears at any stage.

3. At the "petal fall" stage (Fig. 10) spray *apples* with Bordeaux 2-5-50, or lime sulphur 1-50, and *pears* with Bordeaux 3-4-50, or lime sulphur 1-50. The remarks made in the preceding paragraph about moderation in the amount of spray applied, strength of spray and desirability of using a spreader, apply with equal, if not greater, force, at this stage.

4. Under Western Australian conditions further spraying will, in most districts and most seasons, in all probability, not be required. If, however, the season should turn out very moist and cool, or there should be a long sequence of cool, dewy nights and foggy mornings, and for some reason or other the diseases have not been checked, a further spraying with the strengths given under item 3 may be required *ten days after "petal fall," and at monthly intervals thereafter until the onset of hot dry weather definitely precludes any further trouble from the diseases.*

Should, for any reason, spraying ever be required shortly before picking, the formula to use, either for apples or pears, is lime sulphur, 1-100.

The recommendations *re* spraying given above, are summarised in the following table:—

SPRAYING SCHEDULE.

FOR THE CONTROL OF "BLACK SPOT" OR "SCAB" OF APPLE AND PEAR.

All sprays to be used with a spreader (See last section of article).

No.	Time of Application.	Spray to use.	
		Apple.	Pear.
1	"Green-tip," "Spur-bursting," "Delayed dormant"	Bordeaux 5–4–50 or Lime-sulphur 1–15	Bordeaux 5–4–50 or Lime-Sulphur 1–15
2	From "Pre-Pink" ("Open-Cluster") to "Pink"	Bordeaux 3–4–50 or Lime-Sulphur 1–35 to 40	Bordeaux 3–4–50 or Lime-Sulphur 1–35
3	"Petal-fall" ...	Bordeaux 2–5–50 or Lime-Sulphur 1–50	Bordeaux 3–4–50 or Lime-Sulphur 1–50
4	Ten days later than "Petal-fall," *if required*	Bordeaux 2–5–50 or Lime-Sulphur 1–50	Bordeaux 3–4–50 or Lime Sulphur 1–50
5	At monthly intervals thereafter, *if required*	Bordeaux 2–5–50 or Lime Sulphur 1–50	Bordeaux 3–4–50 or Lime Sulphur 1–50
6	Shortly before picking, *if required*	Lime Sulphur 1–100	Lime Sulphur 1–100
7	Autumn, after fruit harvested but before leaves fall, *when disease has been serious during the season*	Bordeaux 5–4–50	Bordeaux 5–4–50

Do not spray with Lime Sulphur if the temperature is above 75° F., or the sunlight is intense. Spraying with Lime Sulphur is best done during dull weather or during the morning or afternoon, and not during the heat and glare of the middle of the day, as under such circumstances a considerable amount of leaf- and fruit-fall may, at times, result. In this connection it should be pointed out that Lime Sulphur is much more likely to cause damage if it follows the use of Bordeaux Mixture earlier in the season, than if Lime Sulphur has been used from the beginning. If Lime Sulphur is to be used at all it should therefore be used right from the "delayed dormant" period.

Lime Sulphur should never be used on Trevitt or Scarlet Pearmain apples after the fruit has set, as these two varieties are very subject to Lime Sulphur injury. Bordeaux mixture, in spite of its russetting tendencies if used somewhat too strong or during cool, moist, slow-drying weather, is more strongly recommended for apple and pear "scab" than Lime Sulphur.

When deciding the correct stage to apply any spray always choose the period when the *majority* of the spurs are at the stage required. Some will always be more backward, and others more advanced, than the majority, but such spurs must be disregarded in deciding on the correct spraying time.

It is important to realize, in connection with the spring sprayings, that it is much more effective to spray the trees several times, at the stages and strengths recommended, than to spray only once, say at the "pinking" stage, with a considerably stronger spray. The reason for this will be readily understood if the section on the "Life History of the Fungus" given above has been clearly comprehended.

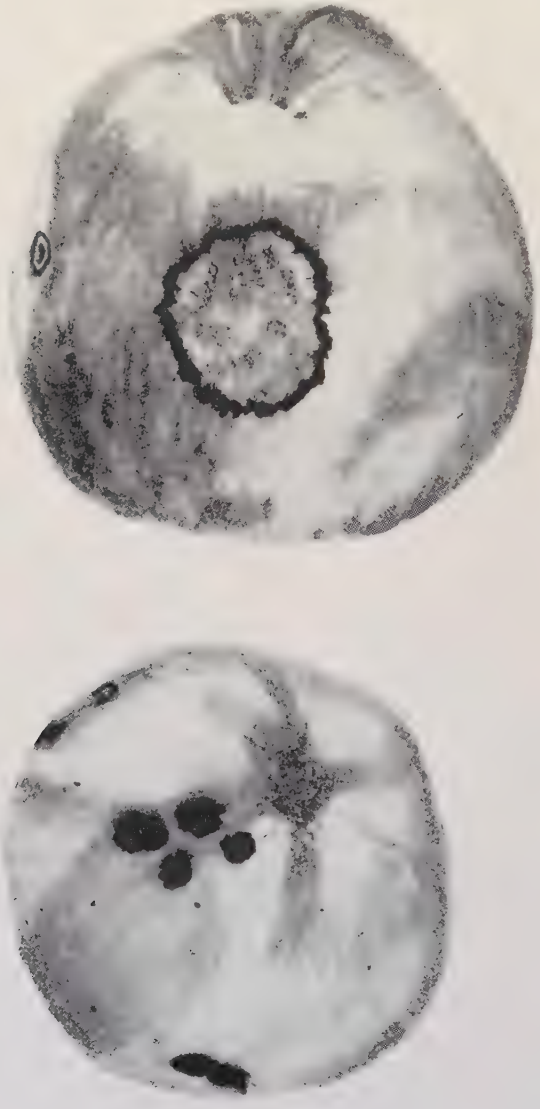

Fig 9.—A. Early infection of Delicious apple with the "apple scab" or "black spot" fungus. Note the large size of the spot, black margin, and the russetted central area. Natural size.

B. Late infection on Doherty (Dougherty) apple, showing small size of the lesions formed under such circumstances. Natural size.

Both after the photos. by E. Bruce Levy in Cunningham's "Fungous Diseases of Fruit-Trees."

MAKING OF BORDEAUX MIXTURE.

As very many apple growers in Western Australia have probably never yet prepared their own Bordeaux mixture, a very simple method of doing so is here briefly given. Obtain two sound wooden barrels.

Then, firstly:—In one dissolve, say, 30 pounds (lbs.) of bluestone in 30 gallons of water, *i.e.*, a pound of bluestone to a gallon of water. This can best be done by suspending the bluestone overnight in a sugar bag or cut-down chaff bag, from a stick placed across the mouth of the cask, so that the bluestone is just beneath the surface of the water. The bluestone can also be fairly readily dissolved by placing it in the cask and pouring hot or boiling water over it. It can, of course, readily be dissolved by heating it with water in a copper vessel over a fire, but no metal other than copper can be used to hold a bluestone solution on account of its corrosive action.

Secondly:—Slake 30 lbs. of "freshly-burnt," "stone" or "quick" lime in the other barrel, by first pouring a little water on to it and then making up to 30 gallons with more water. ("Freshly-burnt" or "quick" lime can be obtained from city merchants in air-tight tins.)

If now it is required to make up a 5-4-50 formula, for example, thoroughly stir the cask containing the bluestone, and, if the spray tank holds 50 gallons, dip out 5 gallons of bluestone solution into the tank. Then run water into the spray tank till it is about three-quarters full. Set the agitator going and then strain 4 gallons of lime concentrate through a fine wire, or bagging, sieve, into the tank. Then make the mixture up to the 50 gallon mark. If the spray tank or barrel holds less or more than 50 gallons the method is, of course, the same, but proportionate amounts of bluestone and lime concentrate must be used. (In any formula for Bordeaux mixture the first figure given means pounds (lbs.) of bluestone, the second means pounds (lbs.) of freshly burnt lime, and the third means gallons of water.) Another method, and perhaps the best of all (except that it necessitates two extra barrels) is to first dilute the required amount of lime concentrate in a barrel with water so as to make half the volume required to fill the spray tank, do likewise with the Bordeaux concentrate in another barrel, and then, through hoses let into the bottoms of both barrels, run the diluted lime and bluestone solutions simultaneously into the spray tank, keeping the agitator going during the process.

I am not prepared to recommend commercial, "already prepared," Bordeaux or Burgundy powders, especially for apples, owing to their liability to be somewhat variable in composition, and also because numerous growers throughout the State have, at various times, suffered severe burning of fruit and foliage (pears, oranges, etc.) when using them, although obtaining quite satisfactory results from similar "home-made" sprays.

In the above-mentioned formulae where lime-sulphur is referred to, the commercial lime-sulphur solution is meant. Thus "lime-sulphur 1-15," for example, means 1 gallon of commercial lime-sulphur (testing 33° on a Beaumé hydrometer) to 15 gallons of water. It should be borne in mind that Bordeaux gives best control of both pear and apple scab, but it is inclined to russet the fruit if used a little too strong for the particular stage of the tree at spraying time; therefore, in all but the "delayed dormant" and "autumn" sprays, an excess of lime is used to counteract this tendency. Danger of injury to fruit or foliage by Bordeaux is much more likely to occur if the

trees are sprayed during cool, moist weather, (when the spray takes a long time to dry). Once thoroughly dried no injury can occur. With lime-sulphur, on the other hand, trouble is only likely to occur if used during

Fig. 10.—Stages of Apple Blossom Development.

1. "Green-tip," "delayed dormant" or "spur-burst." 2. "Tight-cluster." 3. "Open-cluster" or "pre-pink." 4. "Pink." 5. "Full-bloom." 6. Petal-fall." 7. Calyx-closed." *After the drawing by N. J. Adamson, in Cunningham's "Fungous Diseases of Fruit Trees."*

When deciding the correct stage to apply any spray always choose the period when the *majority* of the spurs are at the stage required.

very hot, dry, periods, in which case there may be considerable fruit and leaf fall. The above formulae have, however, in view of all the necessary climatic and other considerations, been prepared so as to be as far as possible on the safe side.

TEST FOR BORDEAUX MIXTURE.

When making up Bordeaux mixture only the very best "freshly-burnt" "stone" or "quick" lime should be used, as the chief functions of the lime are to neutralize the acid properties of the bluestone and turn it into a compound which is only slowly soluble when once it has dried on the leaves. In all the above formulae, except the "delayed dormant" and "autumn" spray, excess of lime has been used. Should there ever be any reason to suspect that the lime is inferior in quality, or that it is to any extent "water-" or "air-slaked" before using, the following test should be made:—

Dissolve 4 ounces of ferro-cyanide of potassium in one pint of water, and add a few drops of this to a small quantity of the Bordeaux mixture to be tested. The Bordeaux should preferably be tested in a glass vessel. Should any brownish or black discolouration occur, the mixture does not contain enough lime, hence lime concentrate must be added until on further testing no discolouration is apparent. A rough test which can be made to see if the Bordeaux mixture contains sufficient lime to neutralize the bluestone, is to dip the clean blade of a penknife into the mixture for several minutes. If the mixture does not contain sufficient lime, a reddish-brown deposit of copper will form on the blade and more lime should be added. *Always use a little too much lime rather than a little too little.*

Fig. 11.—Williams Bon Chrietien or Bartlett pears badly affected with "Pear Scab" or "Black Spot" due to *Venturia pirina*.

Photo. by Author.

THE USE OF SPREADERS WITH BORDEAUX MIXTURE OR LIME SULPHUR.

Whenever Bordeaux mixture or lime sulphur is used, the spreading, wetting, and adhesive qualities of the spray will be very greatly improved by the incorporation of a special spray "spreader" or "sticker." In addition, the spray, on drying, will settle down into a very thin, well-distributed, and more

or less continuous layer, rather than into a number of scattered spots. The fungicides will therefore prove much more efficient with a "spreader" than without, as where the spray dries up in spots very little, if any, protection is afforded to the tissue in between. Where spreaders are used there is also very much less danger of damaging the leaves or fruit, for the reason that the concentration of the spray is never so intense at any one point as if no spreader is used. Moreover less spray is used, and there is not such a tendency to hold the spray nozzles for some time in the one place to try and *force* the material to wet the tissues and stay on.

The following substances are some of those which have been used from time to time as spreaders or stickers in various sprays:—oils, resins, soaps, glue, milk and molasses, but *calcium caseinate*, a by-product obtained from skim milk, is the only one which has ever become very popular or widely used. It is very successful with lime-sulphur, and also gives very good results with Bordeaux mixture. It should be used with either of these sprays at the rate of one half to one pound (½-1 lb.) per 50 gallons of spray. In mixing, make the required amount of calcium caseinate into a paste in a billycan, jug, or other suitable receptacle, by putting the calcium caseinate into the dry container, and then slowly adding a little water from time to time, stirring all the while, so as to form a thin paste (just in the same way as powdered skim milk is mixed by the experienced housewife for human use). When made into a paste, dilute with water, and add to the mixture in the spray tank, keeping the agitator going during the process.

2. If calcium caseinate is not obtainable, a good brand of *commercial powdered skim milk* may be used instead.

Use ½-1 lb. to every 50 gallons of spray, mixing as indicated for calcium caseinate in the preceding section. Powdered skim milk was recently used by Orchard Inspector Flintoff at Manjimup, and gave very good results. Mr. Flintoff writes:—

> ". . . . . the powdered skim milk as recommended by Mr. Pittman was used at the rate of 1 lb. to 35 gallons. Even with this small quantity the effect appears excellent, the mixture spreading over the surfaces of fruit and leaves like a bloom. Bordeaux used without a spreader dries up in spots and blotches."

3. Various other substances may be used as a substitute for *calcium caseinate* with satisfactory results. These are:—

(a) *Sweet skim milk,* used at the rate of half a gallon to every 50 gallons of spray.

(b) *Flour,* used at the rate of ½-1 lb. to every 50 gallons of spray. Mix with water to a thin paste and then add to the mixture in the spray tank.

(c) Glue, ½ ounce to every 50 gallons of spray. Dissolve in hot water and then add to the mixture in the spray tank.

4. All the above spreaders may, quite safely, and with great benefit, be used with either Bordeaux mixture or lime sulphur.

The following may be used with Bordeaux mixture *only,* viz:—

(a) Good quality *soft soap,* 2-3 lbs. per 50 gallons of spray. Dissolve in water and add to the spray mixture in the spray tank, or barrel, only just before the spray is to be used.

(b) *"Resin-Fish Oil"* soap, 2-3 lbs. per 50 gallons of spray. Dissolve in water and add to the spray mixture in the spray tank or barrel only just before the spray is to be used.

FINAL NOTES.

In using any spray spreader the full amount of spray liquid should not be made up in the spray tank or barrel until *after* the spreader has been prepared and added, so that the strength of the fungicide will always be very much the same whenever it is made up to the same formula. In other words, if making up a 3-4-50 Bordeaux, the *final* volume of the spray, *after* the spreader has been added should be just 50 gallons.

Calcium caseinate and powdered or sweet skim milk are recommended in preference to any other spreaders, as they are very efficient and chemically quite inert, and therefore no undesirable complications can possibly follow their addition to the spray materials.

Finally it should be pointed out that before using the spray apparatus, especially after it has been idle for any length of time, it should be thoroughly washed out to remove any chemicals which may have been left from the previous spraying. This is exceedingly important when the spray being used is a different kind from that previously employed, as, according to Cunningham (3), this mixing of different spray materials in the tank is one of the most frequent causes of spraying injury to plant tissues.

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FARMERS' FIELD TRIALS, 1929.

I. THOMAS,
Supt. Wheat Farms.

WHEAT VARIETY TRIAL, R. W. KIRKALDY, GRASS PATCH.

This experiment was planted with the standard varieties Yandilla King (late maturing), Gluyas Early (early maturing), and Nabawa (midseason maturing) to determine which of the three respective types would be most suitable in the district in which the plots were located.

The plots, each .3 acre in area, were planted on light sandy loam, originally carrying silver salmon, mallee, and tea-tree. The land had been cleared and cropped in 1925. At the end of July, 1929, it had been ploughed to a depth of 3½ to 5 inches with a disc implement (sundercut). During the second week in October it was skim ploughed to a depth of 2½ inches. The land was twice harrowed in February after rain and once again immediately prior to seeding. Seed was sown at the rate of 45 lbs. per acre and superphosphate was applied at the rate of 90 lbs. per acre. The rainfall as recorded at the farm was as follows:—

	Jan.	Feb.	Mar.	Apl.	Useful Rains.							Nov.	Dec.	Total for year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
1929 ...	120	97	75	29	227	259	142	129	27	68	852	239	123	1,535

The results obtained are tabulated hereunder:—

Seed—45lbs. per acre. Planted 11th May. Super. 22%—90lbs. acre.

Variety.	Computed Yields per Acre.				Average Yields per Acre.		Percentage yields per Acre.
	Section 1.		Section 2.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	%
Yandilla King	14	12	15	20	14	46	84
Gluyas Early (Control) ...	17	20	18	0	17	40	100
Nabawa	16	6	15	40	15	53	90

These results indicate that either late, midseason, or early maturing varieties of wheat are suitable for this district. However, the earlier maturing varieties show to better advantage than the later maturing varieties when grown under seasonal conditions such as prevailed in this district during 1929.

FARMERS' FIELD TRIALS, 1929.

G. L. Throssell, Dip. Agric., Agricultural Adviser.

Departmental Field Trials were conducted during 1929 on five private farms in the North-Eastern districts of the wheat belt and on two farms in the Corrigin area.

TRIALS IN THE NORTH-EASTERN DISTRICTS.

With Wheat.

Variety Trials.—The early and very early varieties, S.H.J., Geeralying, and Noongaar were tested against the Standard Early variety, Gluyas Early, at Bencubbin, Welbungin, Lake Brown, and East Goomarin.

Rate of Seeding Trials.—The very early variety, Noongaar, was used in these trials at Welbungin, Lake Brown, and East Goomarin.

With Oats.

Variety Trials.—Trials comparing the midseason and early varieties, Guya and Mulga, alongside the Standard Early variety, Burt's Early, were planted at Bencubbin and Kununoppin. At the latter place, however, no result is available, the plots being cut for hay.

With Fodders.

A series of demonstration plots were planted at Bencubbin, while at Kununoppin a few plots were planted, independently, with seeds supplied by the Department.

THE OBJECTS OF THE TRIALS.

In certain areas a misconception has arisen as to the object of these experiments. It will be noticed that the plots with wheat, during the past three years, have been planted from the third week in May onwards and into the fourth week in June. This has been done with a definite object.

Results obtained from experiments conducted at the Experiment Farms situated at "key-positions" throughout the Wheat Belt, and particularly those at Merredin and Yilgarn, have demonstrated that the seeding period is from the middle of April until the end of May, and that the sooner seeding is finished according to the correct time for the particular variety, the better. However, throughout this area there are many farmers who still prolong their seeding operations, for various reasons, well into June. Some of necessity, and others, perhaps, through ignorance. Because of this, these trials were designed to demonstrate—

(a) which variety is most suitable for late seeding;

(b) what rate of seeding would give the best return for late planting.

In any experiments negative results are as important as positive results. It was expected that by planting late in the seeding period fairly low yields would be obtained, and the result will surely demonstrate that farmers should do their utmost to plant the right varieties at the right time; to cease

seeding by the end of May and to start fallowing as early in June as possible. (Readers should refer to the Experiment Farm results, particularly the Time of Planting, Seasonal Variety and Time of Fallowing Experiments published in the March and current issues of the "Journal.")

SIZE OF PLOTS.

All the plots were half an acre in area, being generally thre or four drill widths wide. They were duplicated to reduce experimental error. Buffers, usually two-drill widths, were planted between each plot and cut for hay.

NATURE OF SOILS.

The trials were planted on classes of soil typical of the localities in which they were situated—the details being:—

Bencubbin (B. W. G. Hopwood).—Timber: Mallee, jam and tea-tree scrub. Soil: Light sandy loam.

Welbungin (W. Bagshaw).—Salmon gum and gimlet. Fine red loam, approximating a red morrell type.

East Goomarin (E. Randolph).—Salmon gum, gimlet, and morrell. Fine red loam, approximating a red morrell type.

Lake Brown (J. Mulqueeny).—Salmon gum, gimlet, and mallee. Red sandy loam.

THE SEASON.

The weather conditions, commencing from the beginning of June, 1928, were very adverse. The fallows suffered from the absence of good soaking winter rains which were not augmented by any appreciable falls during the following spring and summer. No rain fell during April to assist weed destruction and seed bed preparation. May and June were characterised by heavy registrations everywhere, benefiting early sown crops but delaying late seeding.

From the beginning of July and onwards the rains gradually became lighter, drought conditions prevailed particularly during August and to the end of October—the last two months of the growing period proving exceedingly dry. It was indeed ironical that heavy rains should fall after the crops had reached maturity, too late to assist them. The total rain which fell on the growing crops, i.e., from germination to maturity, together with the number of rainy days, was as follows:—Lake Brown 247 points (31 rainy days), East Goomarin 345 points (36 rainy days), Welbungin 368 points (32 rainy days). The rainfall up to the end of the growing period is tabulated below:—

	Jan.	Feb.	Mar.	Apl.	Growing Period.						May to Oct.	Rainfall on Growing Crop.
					May.	June.	July.	Aug.	Sept.	Oct.		
Bencubbin	11	84	65	...	302	182	86	100	16	26	712	...
Welbungin	...	90	80	...	352	216	121	84	...	88	861	368
Lake Brown ...	18	64	77	...	278	158	59	54	15	53	617	247
East Goomarin ...	18	144	80	...	352	222	67	67	20	55	783	345

RESULTS.

B. W. G. Hopwood, Bencubbin.

Cultural Details.

The land was fallowed in June, 1928, 4½ inches deep, cultivated with a Springtyne implement in August and again in April. The oat variety trial was planted on 16th and 17th April, while the fallow was harrowed prior to planting the wheats on 25th May. The results obtained are as follows:—

WHEAT VARIETY TRIAL.

Planted 25th May, 1929. Seed 45lbs. per acre. Superphosphate 100lbs. per acre.

—	Variety.	Section 1.	Section 2.	Average, 1929.		Average, 3 years, 1926, 1927, and 1929.	
		Yield per acre.	Yield per acre.	Yield per acre.	Per-cent.	Yield per acre.	Per cent.
		bus. lbs.	bus. lbs.	bus. lbs.		bus. lbs.	
1	S.H.J.	12 18	11 26	11 52	99	15 16	103
2	Gluyas Early ...	12 18	11 45	12 2	100	14 50	100
3	Geeralying	12 14	12 56	12 35	106	...	...
4	Gluyas Early ...	11 45	12 0	11 53	100	14 50	100
5	Noongaar	12 26	13 2	12 44	107	13 14	89

W. Bagshaw, Welbungin.

Fallowing was completed by 30th June, being ploughed to a depth of 4in. It was cross ploughed on 30th June and cultivated with a Springtyne cultivator on 31st August, 23rd March, and 21st May. Germination took place on 2nd June. The varieties did not stool very well and made very little growth, only averaging about 2ft., and matured about 10th October. Noongaar showed out well during the dry spells. The results are as hereunder:—

RATE OF SEEDING TRIAL.

Variety—Noongaar. Planted 24th May, 1929. Superphosphate—90lbs. per acre.

Plot.	Rate of Seed per acre.	Section 1.	Section 2.	Average, 1929.		Average, 3 years, 1926–29.	
		Yield per acre.	Yield per acre.	Yield per acre.	Per cent.	Yield per acre.	Per-cent.
		Bus. lbs.	Bus. lbs.	Bus. lbs.		Bus. lbs.	
1	30lbs.	3 30	2 56	3 13	84	12 6	89
2	45lbs.	3 37	4 1	3 49	100	13 40	100
3	60lbs.	3 51	4 21	4 6	107	14 18	105

WHEAT VARIETY TRIAL.

Planted 24th May, 1929. Seed—45lbs. per acre. Superphosphate—90lbs. per acre.

Plot.	Variety.	Section 1.	Section 2.	Average, 1929.		Average, 3 years, 1926–29.	
		Yield per acre.	Yield per acre.	Yield per acre.	Per-cent.	Yield per acre.	Per-cent.
		bus. lbs.	bus. lbs.	bus. lbs.		bus,. lbs.	
1	S.H.J.	2 44	2 21	2 33	66	12 24	82
2	Gluyas Early ...	4 10	3 34	3 52	100	15 8	100
3	Noongaar	4 16	4 17	4 17	111	12 30	83

J. Mulqueeny, Lake Brown.

Fallowed early in June 3½ inches deep. Springtyne cultivated in August, January, March, and May; harrowed in August and January. The wheats germinated on 9th June and matured about 20th October. As elsewhere, stooling and growth were retarded. Noongaar ripened about a week ahead of the others. The following tables give the results obtained:—

RATE OF SEEDING TRIAL.

Variety—Noongaar. Planted 29th May, 1929. Superphosphate—112lbs. per acre.

Plot.	Rate of Seed per acre.	Section 1. Yield per acre.	Section 2. Yield per acre.	Average, 1929. Yield per acre.	Average, 1929. Per cent.	Average, 1927–29. Yield per acre.	Average, 1927–29. Per cent.
		bus. lbs.	bus. lbs.	bus. lbs.		bus. lbs.	
1	30lbs.	8 22	10 50	9 36	88	9 44	96
2	45lbs.	10 32	11 14	10 53	100	10 8	100
3	60lbs.	11 2	11 22	11 12	103	10 32	104

WHEAT VARIETY TRIAL.

Planted 29th May, 1930. Seed—45lbs. per acre. Superphosphate—112lbs. per acre.

Plot.	Rate of Seed per acre.	Section 1. Yield per acre.	Section 2. Yield per acre.	Average, 1929. Yield per acre.	Average, 1929. Per cent.	Average, 1927–29. Yield per acre.	Average, 1927–29. Per cent.
		bus. lbs.	bus. lbs.	bus. lbs.		bus. lbs.	
1	S.H.J.	7 34	7 54	7 44	89	7 39	83
2	Gluyas Early ...	8 34	8 44	8 39	100	9 16	100
3	Geeralying	7 32	7 48	7 40	89	*5 46	*79
4	Gluyas Early ...	8 44	8 26	8 35	100	9 25	100
5	Noongaar	8 30	†7 52	8 11	95	8 32	90

* Geeralying—Average for two years, 1928 and 1929.
† Outside plot suffered from November storm.

E. Randolph, East Goomarin.

Fallowed in July to a depth of 3½ inches. Cultivated with a disc implement (Sundercut) in September, with a Springtyne in February, harrowed end of March, Springtyne cultivated May 22nd and harrowed 3rd June. The plots were planted on 4th and 5th June and germinated 16th June, maturing about 30th October. Stooling and growth poor, Gluyas Early growing the tallest with a height of 15 inches. The following are the results:—

RATE OF SEEDING TRIAL.

Planted 4th June, 1929. Variety—Noongaar. Superphosphate—90lbs. per acre.

Plot.	Rate of Seed per acre.	Section 1. Yield per acre.	Section 2. Yield per acre.	Average, 1929. Yield per acre.	Average, 1929. Per cent.	Average, 3 years, 1927–29. Yield per acre.	Average, 3 years, 1927–29. Per cent.
		bus. lbs.	bus. lbs.	bus. lbs.		bus. lbs.	
1	30lbs.	7 54	7 36	7 45	94	10 44	95
2	45lbs.	8 30	8 0	8 15	100	11 18	100
3	60lbs.	8 50	8 50	8 50	107	11 27	101

WHEAT VARIETY TRIAL.

Planted 5th June, 1929. Seed, 45lbs. per acre. Superphosphate, 90lbs. per acre.

Plot.	Variety.	Section 1. Yield per acre.	Section 2. Yield per acre.	Average, 1929. Yield per acre.	Average, 1929. Per cent.	Average, 4 years, 1926-29. Yield per acre.	Average, 4 years, 1926-29. Per cent.
		bus. lbs.	bus. lbs.	bus. lbs.		bus. lbs.	
1	S.H.J.	3 48	4 18	4 3	53	9 43	73
2	Gluyas Early ...	7 40	7 40	7 40	100	13 22	100
3	Geeralying	5 6	5 44	5 25	69	*7 28	78
4	Gluyas Early ...	7 40	8 8	7 54	100	13 26	100
5	Noongaar	7 6	9 14	8 10	103	12 3	90

*Geeralying, two years average, 1928 and 1929.

Summary and Discussion of Results.

The following table shows the percentage yields for 1929 and the averages from which comparisons can be made:—

	E. Randolph, East Goomarin.		W. Bagshaw, Welbungin.		J. Mulqueeny, Lake Brown.		B. W. G. Hopwood, Bencubbin.	
	1929.	3 years average.	1929.	3 years average.	1929.	3 years average.	1929.	3 years average.
Rate of Seeding—Variety Noongar								
30lbs.	94	95	84	89	88	96	.	...
45lbs.	100	100	100	100	100	100	..	...
60lbs.	107	101	107	105	103	104	...	...
		4 years average.		3 years average.		3 years average.		3 years average.
Variety Trial—								
S.H.J.	53	73	66	82	89	83	99	103
Gluyas Early ...	100	100	100	100	100	100	100	100
Geeralying	69	78*	...	...	89	79*	106	...
Gluyas Early ...	100	100	100	100	100	100	100	100
Noongaar	103	90	111	83	95	90	107	89

* Two years average.

Rate of Seeding Trials.

The averages for three years indicate that for late planting with early, and hence sparsely stooling varieties, 45lbs. of seed per acre give the best results. While a slight increase in the yield has been noted in the 60lbs. per acre plots, this year more so than in previous years, the increase is not large enough to give a sufficient margin over and above the extra 15lbs. of seed applied. The reason for the slight increase in yield from the heavily seeded plots, particularly in 1929, was on account of the very poor stooling which was noted, and hence these plots produced more plants per acre.

Wheat Variety Trials.

As previously stated, the purpose of these trials was to test the suitability of several early and very early wheats for late planting, comparing them with the standard Early Variety, Gluyas Early, planted at the same time. The results show a marked uniformity on the forest land at Goomarin,

Welbungin, and Lake Brown. At these places, over the period of the trials, Gluyas Early has given the best results, the varieties S.H.J. and Geeralying being particularly inferior. Noongaar yielded better than these two wheats, but on the average not so well as the control Gluyas Early. Noongaar showed to advantage in 1929 when the growing period was shortened by the absence of finishing rains.

On the lighter class of country at Mr. Hopwood's, Bencubbin, both Geeralying and S.H.J. have yielded better than on the heavier forest land at the other centres. It must be remembered too that the trials at this centre were the first planted each year. In 1929 Noongaar yielded the best, but over the average has not done as well as Gluyas Early.

The results confirm the following seeding calendar recommended by the Department for these areas:—

Forest Country—

Nabawa.—April 21st to May 7th.
Gluyas Early.—May 7th to May 31st.
Noongar.—May 21st to May 31st.
Commence fallowing June 1st.

Lighter classes of soil—

Nabawa.—April 14th to May 7th.
Gluyas Early, S.H.J.—May 1st to May 21st.
Geeralying.—May 14th to May 21st.
Noongaar.—May 21st to May 31st.
Commence fallowing 1st June.

Experiments with Oats.

Of the two variety trials with oats conducted during 1929, results are available only from Bencubbin (Mr. B. W. G. Hopwood). The yields, which are for 1929 only, are as follows:—

OAT VARIETY TRIAL.

B. W. G. HOPWOOD, BENCUBBIN.

Planted 16th April, 1929. Seed—38lbs. per acre. Superphosphate—112lbs. per acre.

Plot.	Variety.	Section 1.	Section 2.	Average, 1929.	
		Yield per acre.	Yield per acre.	Yield per acre.	Per cent.
		bus. lbs.	bus. lbs.	bus. lbs.	
1	Mulga	20 6	21 0	20 23	130
2	Burts Early	15 24	16 6	15 35	100
3	Guyra	18 18	17 32	18 5	114

These results, which are for one year only, confirm those obtained at the experiment farms and experience elsewhere that Mulga and Guyra are both very suitable varieties for this district. For a dual purpose oat Mulga is the best variety, Guyra being better for grain than hay.

For hay, Mulga may be planted with safety early in April, and for grain, Guyra about the same time as advised for Nabawa, and Mulga the same as Gluyas Early.

Demonstration Plots with Fodders at Bencubbin.

The opening of the district water scheme and with its consequence, the advent of more sheep in the area, made these demonstration plots a centre of considerable interest to local farmers. The following fodders were tested:—

Leguminous fodders—

Field peas—two varieties.

Lupins—four varieties.

Lucerne.

Subterranean Clover—very early variety.

Horse beans.

Vetch.

Miscellaneous fodders—

Wimmera Rye Grass.

Rape.

Oats in buffers.

The season was such as to render most of these fodder plants failures or partial failures. This was valuable information because, in a district where fairly dry conditions are likely to prevail towards the end of the growing period, it showed it was not safe to sow these fodders on a large scale.

The following observations were recorded:—

Failures—Lucerne, subterranean clover, horse beans, vetches, and the three imported varieties of lupins.

Partial failures—Field peas, blue lupins, rape.

Promising—Wimmera rye grass.

Notes on Growth.

Field Peas.—Fairly good germination. Suffered from lack of finishing rains. The white variety matured about three weeks earlier than the Dunne's.

Lupins (W.A. variety).—Germinated fairly well. Only grew about a foot in height. Not affected by early frosts, but suffered badly from them during flowering. Made little pod and these were attacked by grubs.

Rape.—Poor germination. Did very well considering season. Should do fairly well when sown early and in seasons of early rains.

Wimmera Rye Grass.—Germination very good and grew very well considering the season. Average height above ground 9 inches, with stems quite 2 feet long. Stooled splendidly. This was the most promising fodder and remained green until December. An early strain would be an advantage. The herbage was relished by the sheep.

FARMERS' FIELD TRIALS IN THE CORRIGIN DISTRICT.

Two wheat variety tests were conducted in this area, on the heavy forest land at Mr. J. B. Taylor's, Kunjin, and on scrub plain on the property of Mr. J. B. Ding.

The object of the trial at Mr. J. B. Taylor's was to test early wheats suitable for planting in old paddocks where weeds are expected to be troublesome. The area of suitable land available was limited, and the trial was confined to three varieties. Midseason and late wheats were tested on the scrub plain as these wheats enable early planting, which is desirable on light land.

The rainfall recorded up to the end of the growing period was as follows:—

	Jan.	Feb.	Mar.	Apl.	Useful rains.						Total May-Oct.	Total Jan. to Oct.
					May.	June.	July.	Aug.	Sept.	Oct.		
Kunjin	37	26	93	21	323	430	197	106	70	23	1,149	1,326
Corrigin	28	24	133	13	243	412	168	103	36	28	990	1,188

Variety Trial of Forest Land.

This land, which originally carried salmon gum, gimlet and wandoo, has been farmed for many years. It was fallowed with a mouldboard plow 4 inches deep in July, 1928. It was harrowed in September, tandem disced in October, and the northern half cultivated with a springtyne cultivator in April, and the whole are was springtyne cultivated and harrowed prior to seeding, which took place on May 15th.

The results are shown in the following table:—

WHEAT VARIETY TRIAL.

J. B. TAYLOR, KUNJIN.

Planted 15th May, 1929. Seed—48lbs. per acre. Superphosphate—118lbs. per acre.

Plot.	Variety.	Average Yield per acre.	Per cent.
		bus. lbs.	
1	Gluyas Early	23 47	117
2	Gresley	20 23	100
3	Carrabin	18 48	91

The plots were each half an acre in area and were duplicated, but were not harvested separately.

The results, which are for one year only, confirm the results obtained at the Experiment Farms and elsewhere, that Gluyas Early is a better yielder than the other two varieties. This variety, incidentally, has won the Corrigin Agricultural Society's Crop Competition during the past two years. Like Gresley, it is susceptible to flag smut, whereas Carrabin is resistant.

Carrabin is also a premium wheat and is a better yielder than the other varieties of wheats in this class. It stands up well, but is rather hard to thresh. Although Gluyas Early has a weak straw and is inclined to lodge, it has a very clean straw and is fairly easily handled.

Variety Trial on Scrub Plain.

The site selected for this trial was virgin scrub plain which was fallowed with a disc plough to a depth of 4 to 5 inches in July, 1928, and was tandem disced a week prior to seeding. The land had a slope towards the east and the varieties on upper portion were slightly more exposed than those lower down, and suffered most from the hot winds in September.

All the Nabawa and Yandilla King plots were sown before heavy rain which fell on 2nd May, which necessitated a further cultivation before the other plots were planted on 4th. The land was in a much better condition after this extra working and therefore it is not surprising that those varieties planted after the rain yielded better.

The results obtained are shown in the following table:—

WHEAT VARIETY TRIAL ON SCRUB PLAIN.

J. B. Ding, Corrigin.

Planted 1st and 4th May, 1929. Seed—45lbs. per acre. Superphosphate—130lbs. per acre.

Plot.	Variety.	Section 1.	Section 2.	Average, 1929.	
		Yield per acre.	Yield per acre.	Yield per acre.	Per cent.
		bus. lbs.	bus. lbs.	bus. lbs.	
1	Bena	9 28	7 40	8 34	157
2	Nabawa *	5 10	5 46	5 28	100
3	Yandilla King *	5 42	8 14	6 58	127
4	Ford	8 18	10 40	9 29	109
5	Nabawa	6 46	10 36	8 41	100
6	Federation	11 22	11 0	11 11	129

* Nabawa and Yandilla King both sown dry.

Neither Nabawa nor Yandilla King yielded as well as the other wheats which were sown after rain. On account of the difference in the working prior to seeding, the results are inconclusive.

FARMERS' FIELD TRIALS WITH WHEAT AND OATS.

1929.

L. SHIER, B.Sc. (Agric.),
Agricultural Adviser.

WHEAT TRIALS.

Field Trials with wheat in the Northern Wheat Belt were conducted on the properties of—

(a) N. G. Wright, Balla.

(b) Wandalong Estate, Dartmoor.

(c) Odgers & Murphy, East Tardun.

The properties on which these trials were conducted are situated along the fringe of the Northern Wheat Belt, and the object of the trials was to ascertain the most suitable early varieties of wheat for planting in these areas during the latter part of May.

Although contrary to the usual practice the trials were conducted in each instance on unfallowed land, fallowed land not being available.

Balla (N. G. Wright).

The land on this property on which the trials were conducted was a medium red loam, originally timbered with Yorrel and scrub. It had not been previously cropped, and was not fallowed for the experiments.

The official rains recorded for the 1st May-31st October period are as follows:—

——	Jan.	Feb.	Mch.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Total usefu rain— May–Oct.
Balla ...	...	140	20	8	413	310	90	153	27	24	1,020

Good falls were recorded during May and June, and an even and vigorous germination resulted. The July rains, although scanty, were more plentiful than those of East Tardun and Dartmoor for the same month, and were followed by more appreciable falls in August, September and October.

The five varieties "Noongaar," "Gluyas Early," "S.H.J.," "Merredin" and "Geeralying" were planted on 31st May, with a disc drill, at the rate of 45 lbs. per acre. Superphosphate (22 per cent.) was applied at the rate of 90 lbs. per acre.

The crops, which matured in October, were not harvested till 25th November. Despite this there were no material signs of shedding or lodging in any of the varieties.

The average acre yields and the average acre yields per inch of rain during the growing period are tabulated below:—

——	Rainfall growing period.	Noongaar.		Merredin.		Geeralying.		Gluyas Early.		S.H.J.	
		Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.
	inches.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Balla ...	10·20	21 39	2 7	19 54	1 57	19 22	1 54	19 6	1 52	18 55	1 51

It will be seen that the variety "Noongaar" gave the highest average yield per acre, followed by "Merredin," "Geeralying," "Gluyas Early" and "S.H.J." in that order.

East Tardun (Odgers & Murphy).

The soil was a medium to heavy red loam, originally carrying Yorrel and scrub. The plots were on new land which had not previously been cropped.

The varieties "Noongaar," "Gluyas Early," "S.H.J.," "Merredin" and "Geeralying" were planted on 19th May with a combine cultivator-drill. The seed was planted at the rate of 45 lbs. per acre, with an application of superphosphate of 90 lbs. per acre.

The rainfall officially recorded to the end of October is shown in the accompanying table:—

——	Jan.	Feb.	Mch.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Total useful rain—May-Oct.
East Tardun...	6	262	37	4	267	235	68	79	3	6	658

May and June were the only months in which good rains were recorded, and, although very light falls were recorded for July and August, those of September and October are not worthy of consideration.

The results of the trials are tabulated below:—

——	Rainfall growing period.	Noongaar.		Gluyas Early.		Merredin.		Geeralying.		S.H.J.	
		Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.
	inches.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
East Tardun	6·58	18 15	2 47	17 40	2 41	17 34	2 40	16 7	2 27	15 30	2 21

These results show "Noongaar" to be the most prolific variety, closely followed by "Gluyas Early" and "Merredin." The yields from these three varieties, stated as bushels per inch of growing period rainfall, are particularly good, ranging from 2 bushels 40 lbs. to 2 bushels 47 lbs.

Wandalong Estate, Dartmoor.

The land, which was of the medium red loam type, had originally carried Yorrel and scrub.

The official rainfall figures recorded to the end of October are shown in the following table:—

	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Total useful rain May–Oct.
Dartmoor ...	109	265	7	..	267	205	48	87	8	10	635

The rainfall was not quite as plentiful as at East Tardun, but its distribution was the same, good falls being recorded only during the months of May and June, September and October being practically lacking in this respect.

The land was cropped in 1928, and the stubble had been burnt immediately prior to being prepared for the trial. Ploughing operations were carried out in April, 1929. The plots were seeded on 19th May with a combine cultivator-drill, each of the five varieties "Noongaar," "Gluyas Early," "S.H.J.," "Merredin" and "Geeralying" being planted at the rate of 45 lbs. per acre. Superphosphate was applied at the rate of 90 lbs. per acre.

The variety "Noongaar" was harvested on 17th October, and the remaining varieties on 23rd October, 1929.

The yields from the plots are as follows:—

	Rainfall growing period.	Noongaar.		Merredin.		Geeralying.		Gluyas Early.		S.H.J.	
		Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.	Avge. Yield per acre.	Bushels per inch.
	inches.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Dartmoor	6·35	17 12	2 43	17 10	2 42	16 20	2 34	16 19	2 34	15 46	2 29

Here the varieties "Noongaar" and "Merredin" were the most prolific. The yields from "Geeralying" and "Merredin" were almost a bushel per acre less, whilst "S.H.J." yielded 1½ bushels per acre less.

The table below gives the results of the three trials in summarised form to make comparisons of the different varieties:—

	Rainfall during growing period.	Noongaar.		Merredin.		Gluyas Early.		Geeralying.		S.H.J.	
		Avge. Yield per acre.	Bush. per acre per inch. G.P. Rain.	Avge. Yield per acre.	Bush. per acre per inch. G.P. Rain.	Avge. Yield per acre	Bush. per acre per inch. G.P. Rain.	Avge. Yield per acre.	Bush. per acre per inch. G.P. Rain.	Avge. Yield per acre.	Bush. per acre per inch. G.P. Rain.
	points.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Balla ...	1,020	21 39	2 7	19 6	1 52	18 55	1 51	19 54	1 57	19 22	1 54
East Tardun	658	18 58	2 47	17 40	2 41	15 30	2 21	17 34	2 40	16 7	2 27
Dartmoor	635	17 12	2 43	16 19	2 34	15 46	2 29	17 10	2 42	16 20	2 34
Variety averages		Noongaar: bus. 19 lb. 2		Merredin: bus. 18 lb. 13		Gluyas Early: bus. 17 lb. 42		Geeraling: bus. 17 lb. 16		S.H.J.: bus. 16 lb. 44	

From this table it will be seen that "Noongaar" is the most prolific variety in each instance, and of the five varieties sown seems to be the one most suited for late planting in these areas. At Balla and East Tardun the variety "Merredin" showed to advantage. At Dartmoor, however, the variety "Geeralying" did considerably better than it, whilst from "S.H.J." an equal yield was obtained. However, taking the general average from the three centres the varieties yielded in the order "Noongaar," "Merredin," "Gluyas Early," "Geeralying" and "S.H.J."

Another interesting feature of the trials is shown in the following table. At East Tardun and Dartmoor the growing period rainfall was not more than 6½ inches, but despite this, yields of 2 bushels 36 lbs. per acre per inch of rain were obtained, while at Balla, with a little more than 10 inches of rain during the growing period, the average per inch of useful rain was just below 2 bushels:—

AVERAGE YIELD OF ALL PLOTS.

	Yield per acre.		Yield per acre per inch G.P. rainfall.	
	bus.	lbs.	bus.	lbs.
Balla	19	40	1	56
East Tardun	17	8	2	36
Dartmoor	16	31	2	36

OAT TRIALS.

A variety trial with oats was carried out with three varieties on the property of Mr. J. K. Forrester, at Carnamah.

The land on which the trials were planted had originally been timbered with heavy ti-tree scrub running into york gum at one end. The soil was of

a red loamy nature, and had been ploughed four inches deep with a mould-board plough during August, 1928, and was cultivated with a springtyne implement in October.

The seed was planted at the rate of 45 lbs. per acre, with an application of 120 lbs. of superphosphate (22 per cent.) per acre, on the 15th May with a combined cultivator-drill. Each variety was planted in duplicate and each plot was half an acre in area.

The rainfall for 1929, together with the average for the past 38 years, is hereunder:—

Year.	Jan.	Feb.	Mar.	Apl.	Useful Rains.							Nov.	Dec.	Total for year.
					May	June.	July.	Aug.	Sep.	Oct.	Total.			
1929 ...	26	113	22	8	352	425	214	121	35	24	1,171	118	...	1,458
Av. 38 yrs.	45	64	79	70	214	324	282	223	136	70	1,249	35	35	1,577

The plots were harvested for grain on the 28th October; the results obtained are set out below:—

Variety.	Yields per Acre.					Average.	
	Plot No.	Average.		Plot No.	Average.		
		bus.	lbs.		bus.	lb.	bus. lbs.
Guyra	1	35	14	4	31	16	33 15
Burt's Early	2	30	38	5	31	18	31 8
Mulga	3	31	14	6	32	38	32 6

Good yields were obtained from all three varieties, and, although the results are for one year only, they indicate that these varieties are suitable for this area.

FIELD EXPERIMENTS WITH WHEAT, 1929.

MERREDIN EXPERIMENT FARM.

I. Thomas, Supt. of Wheat Farms,
and
J. H. Langfield, Manager.

The following field experiments were conducted with wheat at the Merredin Experiment Farm during 1929 in addition to those published in the March issue of the "Journal of Agriculture":—

Depth of Ploughing Experiment.
Mulching Experiment.
Fallow v. Non-Fallow Experiment.
Early v. Late Fallow Experiment.

The monthly rainfall recorded at the farm for 1929, together with the average for the past 17 years, is as under:—

	Jan.	Feb.	Mar.	Apl.	Growing Period.						Total Useful Rain.	Nov.	Dec.	Total for year.
					May.	June.	July.	Aug.	Sept.	Oct.				
1929 ...	50	162	27	...	357	309	119	94	13	35	927	220	5	1,441
Av. 18 yrs.	58	59	116	73	135	186	191	137	94	77	820	46	55	...

The growing period rainfall for the year is some 1.07 inches above the average and might indicate that an exceptionally good season had been experienced. Closer observation shows that 6.66 inches fell during May and June and made seeding exceedingly difficult. August, September, and October, the critical months for wheat, recorded only 1.42 inches; September yielding only 13 points, registered in four falls, and therefore almost useless. Add to this the fact that 2.20 inches fell in November, *i.e.*, after the crops were mature, and therefore of no benefit.

The experiments were conducted on a rich clay loam typical of salmon gum and gimlet country.

Depth of Ploughing Experiment.

This experiment has been conducted for the past 15 years (commenced 1915), and its object is to determine the comparative effects upon resultant crops of ploughing land to different depths.

The three plots used for the experiment were ploughed as follows:—

Plot No. 1—4 inches, representing shallow ploughing.
Plot No. 2—6 inches, representing medium ploughing.
Plot No. 3—8 inches, representing deep ploughing.

Each plot contained one-eight of an acre, and was repeated five times, all being harvested for grain.

The plots were ploughed to their respective depths in July, 1928, with a disc plough. They were springtyne cultivated in September, harrowed after 1½ inches of rain on February 15th, and cultivated with a springtyne implement in early April and again before planting.

The variety "Nabawa" was planted on May 1st at the rate of 45 lbs. seed per acre with an application of 120 lbs. of superphosphate (22 per cent.). On May 8th the plots were harrowed.

The results obtained last year, together with the average results for the past 15 years, are tabulated below:—

DEPTH OF PLOUGHING EXPERIMENT, 1929.

Variety—Nabawa. Planted on 1st May. Superphosphate (22%) 120lbs. per acre. Seed, 45lbs. per acre.

Depth of Ploughing.	Computed Yields per Acre.					Average Yields per acre, 1929.	Percentage Yields 1929.	Average Yields per acre, 1915–29.	Percentage Yields 1915-29.
	Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.				
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.		bus. lb.	
4in.	22 32	21 49	26 4	23 45	23 75	24 3	104	23 44	103
6ins.	21 34	22 47	23 16	24 7	24 15	23 12	100	22 56	100
8ins.	21 49	23 16	24 7	24 36	21 27	23 3	99	22 56	100

These results are consistent with those of the past 15 years and show that there is no advantage to be gained by ploughing to a greater depth than four inches.

Mulching Experiment.

The object of this experiment is to determine how far and under what conditions the cultivation of winter-fallowed land is profitable during the spring and summer months.

The land on which the experiments were conducted was ploughed in June, 1928, to a depth of four inches with a disc plough. Subsequent cultivations were carried out according to the requirements of the experiment. Three plots were necessary and were treated as follows:—

Plot 1. *Well-worked Fallow.*—Cultivated during spring, again when required during summer after a fall of rain of 25 points or over, and again prior to seeding, the object being to maintain a mulch throughout the fallowed period and to destroy weed growth.

Plot 2. *Ordinary Fallow.*—Cultivated during spring and prior to seeding only.

Plot 3. *Neglected Fallow.*—Cultivated just prior to seeding only.

Sheep were depastured on the plots after ploughing.

The plots were each one-eighth of an acre in area and were repeated five times, all being eventually harvested for grain.

All plots received cultivations with a springtyne implement at the end of April and before planting, and were harrowed after planting.

The experiment was planted on the 8th May with the variety "Nabawa" sown at the rate of 45 lbs. per acre with superphosphate (22 per cent.) at the rate of 120 lbs. per acre.

The results for 1929, together with the results of the past 13 years, are set out hereunder:—

MULCHING EXPERIMENT, 1929.

Variety—Nabawa. Planted on 8th May. Superphosphate (22%) 120lbs. per acre.

Seed, 45lbs. per acre.

Treatment.	Computed Yields per Acre.										Average Yields per acre, 1929.		Percentage Yields 1929.	Average Yields per acre, 1915–29.		Percentage Yields, 1915–29.
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.							
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.		bus.	lb.	
Mulched in spring after rain during summer and before planting. (Well worked Fallow)	23	38	21	49	21	34	22	32	21	12	22	9	99	22	36	102
Mulched in spring and before planting only. (Ordinary Fallow)	19	44	22	3	24	36	23	38	22	10	22	26	100	22	8	100
Mulched before planting only. (Neglected Fallow)	20	6	20	6	24	51	22	18	16	34	20	47	93	20	56	95

This year's results show very little difference in yield between the continuously cultivated plots (well-worked fallow) and the plots cultivated only in the spring and prior to seeding (ordinary fallow), but both these show an increase over the plots ploughed in the previous winter and mulched before planting only (neglected fallow). This confirms the average results of the past 13 years during which time the experiment has been conducted continuously. It also shows and confirms previous years' results in that the yields of the wheat crop are decreased when land ploughed the previous winter receives no further attention until seeding time.

Fallow v. Non-Fallow Experiment.

This experiment was conducted to show the practical and economic advantages, if any, of fallowing in heavy types of soil.

Five plots of one-quarter acre area were used, three of these being fallowed and two unfallowed. The three fallowed plots were ploughed to a depth of four inches with a disc implement in June, 1928, cultivated with a springtyne cultivator in September, harrowed after 1½ inches of rain in February, springtyne cultivated in April, and twice cultivated before seeding. The two unfallowed plots were disc-ploughed to a depth of four inches in early May, 1929, and springtyne-cultivated twice before seeding.

The variety "Gluyas Early" was planted in all five plots on May 23rd at the rate of 45 lbs. per acre, and superphosphate (22 per cent.) was applied at the rate of 120 lbs. per acre.

The results were as follows:—

FALLOW *v.* NON-FALLOW EXPERIMENT, 1929.

Variety—Gluyas Early. Planted on 23rd May. Superphosphate (22%)—120lbs. per acre. Seed, 45lbs. per acre.

Treatment.	Computed Yields per Acre.					Average Yields per acre, 1929.	Percentage Yields, 1929.
	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.		
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	
Fallowed	24 7	...	24 3	...	18 30	22 13	100
Unfallowed ...	...	18 4	...	14 8	...	16 6	73

Little observation is required to note the improved yields from the fallowed plots. The difference in yield definitely indicates the economic advantages of fallow, for in these plots increased yield of some 6 bushels 7 lb. per acre was the direct result of fallowing.

Briefly some of the advantages of fallowing are.—

1. Permits of seeding at the correct time.
2. A better chance is afforded for the destruction of weeds.
3. More moisture is conserved in normal years, thus providing a better insurance against dry spells at critical periods.
4. Fallowing renders it possible to work the soil down to an even tilth, resulting in an even and strong germination.
5. Stimulates the production of nitrates, sweetens and aerates the soil.
6. Observations show that fallowing helps to check "Takeall" and other fungus diseases.
7. Increased yields.

Early v. Late Fallowing Experiment.

This experiment has been conducted for the past six years with the object of determining the effects, if any, between early and late winter fallowing on resultant wheat crops grown on heavy land.

Two plots, each of half an acre in area, were required, and the crop was harvested for grain. The early fallow plot was ploughed the first week in June, 1928, and the late fallow plot the third week in August, 1928. Both were ploughed with a disc plough to a depth of four inches and were subsequently cultivated in September with a springtyne cultivator; harrowed after rain in February, cultivated with a springtyne in April, and twice cultivated with the same implement immediately before planting.

On May 1st, 1929, the variety Nabawa was planted at the rate of 45 lgs. per acre with an application of 120 lbs. of 22 per cent. superphosphate per acre.

In the results tabulated below, the yields for 1929 are shown, together with the average for the past six years.

EARLY *v.* LATE FALLOW EXPERIMENT. 1929.

Planted 1st May, 1929. Variety—Nabawa. Superphosphate (22%)—120lbs. per acre. Seed—45lbs. per acre.

Date ploughed.	Computed Yields per acre.		Average Yields per acre.	Percentage Yields.	Average Yields per acre, 6 years.	Percentage Yields, 6 years.
	Section 1.	Section 2.				
	bus. lb.	bus. lb.	bus. lb.		bus. lb.	
1st week in June	16 36	...	16 36	100	23 4	100
3rd week in August	...	13 20	13 20	80	19 17	83

Heavy rains fell in May and June, after the plots were planted, and these favoured the late fallow by tending to equalise the moisture content of both early and late fallowed plots. Despite this fact, the early fallow shows to advantage in the results, not only last year, but during the whole six years the experiment has been conducted, and from this it can be concluded that when the land is fallowed early heavier yields are obtained.

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SALMON GUMS EXPERIMENT FARM.

FIELD EXPERIMENTS WITH WHEAT, 1929.

I. THOMAS, Supt. of Wheat Farms,
L. G. SENIOR, Manager.

Other than those published in the March, 1930, issue of this Journal, the following field experiments were conducted with wheat at the Salmon Gums Experiment Farm during 1929:—

Depth of Ploughing Experiment.
Time of Ploughing Experiment.
Mulching Experiment.

The monthly rainfall and the total for 1929 recorded at the farm are shown in the table below, together with the average for the past 11 years recorded at Salmon Gums, one mile distant from the farm:—

	Jan.	Feb.	Mar.	Apl.	Growing period. May.	June.	July.	Aug.	Sept.	Oct.	May to Oct.	Nov.	Dec.	Total for year.
At Experiment Farm, 1929	106	65	73	26	125	207	159	163	21	35	710	150	43	1,173
Average, 11 years, Salmon Gums	31	50	112	106	154	152	135	131	115	126	813	81	81	1,273

The growing-period rain for 1929 is almost an inch below the eleven years' average. Sufficient rain fell in May and June for good germination, and the July and August recordings were above the average. However, only 21 points were recorded during September, and by the end of that month the crops were showing signs of distress, and eventually did not yield up to earlier expectations.

The land on which the experiments were planted was of the heavier mallee type.

Depth of Ploughing, 1929.

This experiment, which was conducted this year on red loam cleared in 1926 and first cropped in 1927, has for its object the ascertaining the most economical depth to plough for the wheat crop.

Three plots (each replicated five times) were required, one ploughed to a depth of two inches, one to four inches, and one to five inches. It was intended to plough the last-mentioned plot to a depth of six inches, but the condition of the land did not permit of this being done.

All the plots were ploughed to their respective depths in June, 1928, and cross-ploughed in September-October of that year to kill self-sown wheat plants. In January, 1929, all the plots were cultivated with a spring-tyne implement, and this operation was repeated ahead of the drill.

The 2-inch plots had a tendency to set and become hard more readily than either of the other two, making it more difficult to obtain a suitable seed bed.

On 13th May, 1929, the variety "Nabawa" was planted at the rate of 45 lbs. per acre. Superphosphate (22 per cent.) was applied at the rate of 112 lbs. per acre. The lack of rain during September and October seriously affected the results of all crops.

The results of the experiment are given in table form below:—

DEPTH OF PLOUGHING EXPERIMENT. 1929.

Variety—Nabawa. Planted on 13th May, 1929. Superphosphate (22%)—112lbs. per acre. Seed—45lbs. per acre.

Depth of Ploughing.	Computed Yields per Acre.					Average Yields per Acre, 1929.	Percentage Yields, 1929.
	Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.		
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%
2 inches	12 47	13 24	13 46	13 9	13 24	13 18	94
4 inches	13 46	14 0	14 51	13 46	14 22	14 9	100
5 inches	12 18	14 0	13 24	14 8	11 56	13 9	93

From these results, and in view of the difficulty in maintaining the soil in a suitable condition, it would appear that 4 inches is the most suitable and economical depth to plough, but as the results are for one year only, a definite conclusion cannot be arrived at.

Time of Ploughing Experiment.

This experiment is conducted with the object of determining to what extent the time of ploughing (fallowing) affects a resultant wheat crop.

The land on which the experiment was conducted this year was originally timbered with Silverbark and Mallee. Three plots, treated in the following manner, were required:—

Plot 1. Ploughed in March, 1928. (Long Summer Fallow)
Plot 2. Ploughed in June, 1928. (Early Winter Fallow.)
Plot 3. Ploughed in September. (Late Winter Fallow.)

Each plot was repeated five times, and harvested for grain.

With the exception of the time of the initial operation (ploughing), all plots were treated alike. They were cross-disc cultivated in October to destroy self-sown wheat plants, and in January they were cultivated with a springtyne implement. They were again cultivated before seeding.

The variety Nabawa was planted on the 14th May, 1929, at the rate of 45 lbs. per acre. Superphosphate (22 per cent.) was applied at the rate of 112 lbs. per acre.

TIME OF PLOUGHING EXPERIMENT, 1929.

Variety—Nabawa. Planted on 14th May. Superphosphate (22%)—112lbs. per acre. Seed—45lbs. per acre.

Time of Ploughing.	Computed Yields per Acre.					Average Yields per acre, 1929.	Percentage Yields, 1929,	Average Yields per acre, 1928-29.	Percentage Yields, 1928-29
	Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.				
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.		bus. lbs.	
Ploughed in March	9 45	10 43	10 58	10 58	11 56	10 52	95	13 22	93
Ploughed in June	11 12	11 27	11 5	11 20	12 4	11 26	100	13 39	100
Ploughed in September	10 7	10 21	10 36	11 5	11 5	10 39	93	12 43	92

These results are in favour of the June fallowing, indicating that, where possible in this district, the initial operation of ploughing should be carried out immediately after seeding. Difficulty was experienced with March ploughing as a result of the dry spring and summer months. Apart from this, it is difficult to understand why the results from the plots ploughed in March did not equal those plots ploughed in June.

Mulching Experiment, 1929.

This experiment is planned to show the advantage, if any, of working winter-fallowed land during the spring and summer months.

For this purpose three plots were required, and are designated "Well-worked Fallow," "Ordinary Fallow" (Control), and "Neglected Fallow." They were one-eighth acre in area, and were as follows:—

1. *Well-worked Fallow.*—Cultivated during spring, again when required during summer after 25 points of rain or over, and again before seeding, the object being to maintain a mulch during the fallowed period and to destroy weed growth. The dates of the various cultural operations were as follow: ploughed June, 1928; cultivated October, 1928, January, 1929, 22nd February, 20th March, and again ahead of the drill.

2. *Ordinary Fallow.*—Cultivated during spring and prior to seeding only. Date of cultural operations: ploughed June, 1928, cultivated 23rd October, 1929, and again ahead of drill.

3. *Neglected Fallow.*—Ploughed in June, 1928, and cultivated immediately prior to seeding.

Each plot was repeated five times, and all were situated on red loamy soil. The land, previous to being cleared, was timbered with Silverbark and Mallee.

The variety "Nabawa" was planted on the 15th May, 1929, at the rate of 45 lbs. per acre. Superphosphate (22 per cent.) was applied at the rate of 112 lbs. per acre.

The results are tabulated below:—

MULCHING EXPERIMENT, 1929.

Variety—Nabawa. Planted on 15th May. Superphosphate (22%)—112lbs. per acre Seed—45lbs. per acre.

Treatment.	Computed Yields per acre.					Average Yields per acre, 1929.	Percentage Yields, 1929.
	Sec. 1.	Sec. 2.	Sec. 3	Ssc. 4.	Sec. 5.		
	bus. lbs.	bus. lbs.	bus. lbs.	bus, lbs.	bus. lbs.	bus. lbs.	
Mulched in spring, after rains during summer and before seeding	14 15	14 30	14 30	13 53	13 46	14 11	104
Mulched in spring and before seeding (Control)	13 53	14 59	13 17	13 9	12 55	13 39	100
Mulched before seeding only	14 37	15 7	14 0	13 31	13 2	14 3	103

This is the first year this experiment has been conducted at this farm, and therefore no definite conclusions can be arrived at.

FIELD EXPERIMENTS WITH WHEAT, 1929.

YILGARN EXPERIMENT FARM.

I. Thomas,
Superintendent of Wheat Farms, and
G. K. Stevens,
Farm Manager.

The following experiments, in addition to those published in the March issue of the Journal, were conducted at the Yilgarn Experiment Farm last year:—

Depth of Ploughing Experiment.
Time of Ploughing Experiment.
Mulching Experiment.

The monthly rainfalls, as recorded at the Farm for 1929 and 1928, together with the average for the past 40 years, as officially recorded at Southern Cross, eight miles west of the Farm, are set out below—

——	Jan.	Feb.	Mar.	Apl.	Growing Period.						Total, May-Oct.	Nov.	Dec.	Total for year.
					May.	June.	July.	Aug.	Sept.	Oct.				
1929 ...	36	120	50	...	275	145	57	25	9	60	571	294	...	1,071
1928 ...	92	...	62	50	170	76	165	89	48	7	555	...	57	816
Av. 40 yrs.	50	59	106	72	194	139	144	107	79	63	726	50	46	1,051

From these records, it will be seen that, except for the excellent rains which were experienced during the months of May and June, resulting in a good even germination, the crops were grown under extremely adverse climatic conditions.

Depth of Ploughing Experiment.

The object of this experiment is to determine the comparative effect upon resulting wheat crops of ploughing the land to different depths. For the purpose of this experiment three plots (each replicated five times), were required, and were ploughed to depths of two inches, 4 inches and six inches respectively.

Previous to being cleared in 1928 the land was timbered with Salmon Gum and Gimlet. For this year's experiment the plots were ploughed in June, 1928. All plots were cultivated with a Springtyne implement in September, January, February and again immediately prior to seeding. On each occasion the "two-inch deep" plots received additional cultivation in order to break the hard surface and obtain a mulch. At seeding time several cultivations were necessary to bring these plots into the desired tilth.

The variety "Gluyas Early" was planted on the 13th May at the rate of 42 lbs. per acre with an application of 112 lbs. of superphosphate (22 per cent.), per acre.

The results are as under:—

DEPTH OF PLOUGHING EXPERIMENT, 1929.

Variety—Gluyas Early. Superphosphate (22%)—112lbs. per acre. Planted on 11th May. Seed—42lbs. per acre.

Depth of Ploughing.	Computed Yields per Acre.					Average Yields per acre, 1929.	Percentage Yields, 1929.
	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.		
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%
2 inches	7 41	6 27	5 14	7 41	9 45	7 22	82
4 inches	9 1	6 49	*	8 46	11 20	8 59	100
6 inches	8 46	7 19	7 55	8 10	9 52	8 24	93

* Discarded owing to accident at seeding time.

As the results are for the one year only, no definite conclusion can be arrived at, but, in view of the difficulty experienced in maintaining the mulch during the fallowed period, these results indicate that the deeper ploughing is advisable.

Time of Ploughing Experiment.

The object of this experiment is to determine whether the time of ploughing has any effect on the resultant wheat crop on heavy land.

This is the first year the experiment has been conducted on this farm, and the land on which the plots were situated was of the heavy Salmon Gum and Gimlet type.

Three plots were required, and, as except for the initial ploughing operation, all three were treated in a similar manner. One plot was ploughed in March, 1928, one in June and one in August, 1928. Subsequent cultivation took place during September, January, February and before seeding on all plots. Each plot was replicated five times.

The results are as set out below:—

TIME OF PLOUGHING EXPERIMENT, 1929.

Variety—Gluyas Early. Planted on 13th May, 1929. Superphosphate (22%)—112lbs. per acre. Seed—42lbs. per acre.

Treatment.	Computed Yields per Acre.					Average Yelds per Acre.	Percentag Yields.
	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.		
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%
Ploughed March 15th, 1928	10 7	7 26	7 55	7 41	9 45	8 35	90
Ploughed June 15th, 1928	11 27	9 8	9 23	7 33	9 59	9 30	100
Ploughed August 15th, 1928	9 38	5 14	7 33	7 26	6 27	7 16	76

The results are for one year only, and no definite conclusion can be arrived at. However, they confirm the results of a similar experiment conducted at the Chapman and Salmon Gums Experiment Farms last season.

Mulching Experiment.

The object of this experiment is to determine how far and under what conditions the cultivation of winter-fallowed land is profitable during the spring and summer months. The land on which the experiment was conducted was ploughed with a disc implement in June, 1928.

Three plots were necessary and to meet the requirements of the experiment, they were treated as follows:—

Plot No. 1—*Well worked Fallow.*— Cultivated during spring, again when required during summer, after 25 points of rain or over, and again prior to seeding, the object being to maintain a mulch throughout the fallowed period and to destroy weed growth.

Plot No. 2—*Ordinary Fallow.*—Cultivated during spring and prior to seeding only.

Plot No. 3—*Neglected Fallow.*—Cultivated prior to seeding only.

The land on which the experiment was conducted this year was typical Salmon Gum and Gimlet timber country, and had not been previously cropped.

Plot No. 1 this year received cultivations with a Springtyne implement in September, January, February and March, and again before seeding; Plot No. 2 was cultivated in September and again before seeding, while Plot No. 3 was cultivated prior to seeding only.

The variety "Gluyas Early" was planted on 13th May, 1929, at the rate of 42 lbs. per acre; superphosphate (22 per cent.) was applied at the rate of 112 lbs. per acre.

Last year's results, and the average results for the two seasons that the experiment has been conducted, are set out below:—

MULCHING EXPERIMENT, 1929.

Variety—Gluyas Early. Planted on 11th May. Superphosphate (22%)—112lbs. per acre. Seed—42lbs. per acre.

Treatment.	Computed Yields per Acre.					Average Yields per acre, 1929.	Percentage Yields, 1929.	Average Yields per acre, 1928-29.	Percentage Yields. 1928-29.
	Sec. 1,	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.				
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	bus. lbs.	%
Mulched in spring, after rains during summer, and before seeding	10 43	9 38	9 45	11 34	10 36	10 27	109	16 18	109
Mulched in spring and before seeding (Control)	9 8	9 23	9 23	10 29	9 45	9 38	100	15 2	100
Mulched before seeding only	7 48	8 39	8 54	9 45	9 45	8 58	93	15 2	100

This year's results, and the average results for the two years the experiments have been conducted, indicate that greater yields are obtained when the fallow is cultivated during the spring and during the summer months should appreciable falls of rain occur.

FIELD EXPERIMENTS WITH WHEAT.

CHAPMAN EXPERIMENT FARM.

I. THOMAS,
Superintendent of Wheat Farms.

P. JEFFREY,
Manager.

In addition to the experiments published in the March issue of this Journal, the following experiments were conducted during 1929 with wheat at the Chapman Experiment Farm:--

Depth of Ploughing Experiment.
Time of Ploughing Experiment.
Mulching Experiment.

The following table shows the monthly rainfall recorded at the Farm as well as the average for the previous 24 years.

Year.	Jan.	Feb.	Mar.	Apl.	Growing period.						Total, May-Oct.	Nov.	Dec.	Total, for Year.
					May.	June.	July.	Aug.	Sept.	Oct.				
1929 ...	...	40	20	10	424	643	189	190	73	35	1,554	106	3	1,733
* Previous 24 years average	28	48	65	43	238	418	397	268	164	96	1,581	29	23	1,817

* This average as appeared in the March issue was incorrect.

The seasonal rains commenced early in May and during that and the following month the rainfall was considerably above the average for that period. The rainfall for the remaining months of the growing period, however, although below the average, was sufficient for the crop to mature normally on account of the previous excessive rain.

Depth of Ploughing Experiment.

This experiment was conducted on land ploughed to the respective depths in August, 1928, springtyne cultivated in September and October and again prior to seeding.

It is designed to determine the comparative effects upon the crop when the land is ploughed to different depths. Three plots were required and were ploughed as follows:—

Plot 1.—4 inches, representing shallow ploughing.
Plot 2.—6 inches, representing medium ploughing.
Plot 3.—8 inches, representing deep ploughing.

The plots were each an eighth of an acre in area and were repeated five times.

The land on which the experiment was conducted this year was cleared of wattle and jam timber some years previously. Heavy rainfall during May and June caused waterlogging and growth was retarded.

The results obtained this year, together with the average results for the past 15 years are as follow:—

DEPTH OF PLOUGHING EXPERIMENT, 1929.

Variety—Nabawa. Planted on 9th May, 1929. Superphosphate (22%)—112lbs. per acre. Seed—45lbs. per acre.

Depth of Ploughing.	Computed Yields per Acre.										Average Yields per acre, 1929.		Percentage Yields, 1929.	Average Yields, per acre, 1915-29.		Percentage Yields, 1915-29.
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.							
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.		bus.	lbs.	
Ploughed 4in. deep	12	55	12	47	14	37	11	27	14	15	13	12	88	16	16	100
Ploughed 6in. deep (Control)	14	37	14	15	14	59	15	50	15	36	15	3	100	16	16	100
Ploughed 8in. deep	13	24	15	57	15	21	13	31	15	57	14	50	99	16	59	104

The results for this year are in favour of the deeper ploughing. This was the case last year when the differences were not nearly so marked. However, the average results since 1915 (15 years), when the trial commenced, show very little difference, at the same time indicating that deeper ploughing, though not economical, does not decrease the yields of the wheat crop.

Time of Ploughing Experiment.

The experiment is being conducted in order to ascertain the comparative effects upon the wheat crop of long summer fallow, early winter fallow and late winter fallow.

For the purpose of the experiment three plots ploughed in March, June and August, were required. The plots were replicated five times.

Ploughing was carried out to a depth of four inches, the soil being a light sandy loam.

The plots ploughed in March were springtyne cultivated in June on account of weed growth. All plots were cultivated in August, September and prior to seeding in May.

TIME OF PLOUGHING EXPERIMENT, 1929.

Variety—Nabawa. Planted on 10th May. Superphosphate (22%)—112lbs. per acre. Seed—45lbs. per acre.

Time of Ploughing.	Computed Yields per Acre.										Average Yields per acre, 1929.		Percentage Yields, 1929,
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4		Sec. 5.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	
Ploughed March, 1928 (Summer fallow)	9	16	9	45	10	7	10	21	10	58	10	9	88
Ploughed June, 1928 (Control) (early winter fallow)	12	55	11	20	12	4	9	52	11	5	11	27	100
Ploughed August, 1928 (late winter fallow)	10	14	8	3	8	54	8	39	8	39	8	54	78

The results are for one year only and hence cannot be taken as conclusive. However they confirm the results of experiment elsewhere, indicating that early winter fallow is considerably better than late winter fallow.

Mulching Experiment.

The object of this experiment is to determine how far and under what conditions the cultivation of winter fallowed land is profitable during the spring and summer months.

The experiment has been conducted since 1914, and as in previous years the following system of cultivation was adopted.

Plot 1. (*Well Worked Fallow*).—Cultivated during spring, when required during summer, after 25 points of rain or over and again prior to seeding, the object being to maintain a mulch throughout the fallowed period and to destroy weed growth.

Plot 2. (*Ordinary Fallow—Control*).—Cultivated during spring and prior to seeding only.

Plot 3. (*Neglected Fallow*).—Cultivated prior to seeding only. The land was fallowed in July, 1928, and the plots were cultivated as mentioned above. The well-worked fallow received four cultivations during the summer months.

The results for this year and the average results for 1914-1929 are as follow:—

MULCHING EXPERIMENT, 1929.

Variety—Nabawa. Planted on 13th May, 1929. Superphosphate (22%)—112lbs. per acre. Seed—45lbs. per acre.

Grain yields.

Treatment.	Computed Yields per Acre.					Average Yields per acre.	Percentage Yields.	Average Yields per acre, 1914-29.	Percentage Yields, 1914-29
	Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.				
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.		bus. lbs.	
Cultivated in spring, after summer rains and before seeding	16 4	16 4	17 54	14 0	14 59	15 48	100	16 25	108
Cultivated in spring and before seeding (Control)	15 43	16 12	17 3	15 14	14 37	15 46	100	15 14	100
Cultivated before seeding only	14 51	16 56	16 19	15 29	14 0	15 31	98	13 51	91

Hay yields.

Treatment.	Computed Yields per Acre.			Average Yields per acre.	Percentage Yields.	Average Yields per acre, 1914-29.	Percentage Yields, 1914-29.
	Section 1.	Section 2.	Section 3.				
	C. Q. L.	C. Q. L.	C. Q. L.	C. Q. L.		C. Q. L.	
Cultivated in spring, after summer rains and before seeding	18 1 25	20 0 19	21 1 10	19 1 13	103	26 1 8	106
Cultivated in spring and before seeding (Control)	18 1 10	18 1 3	20 1 27	19 0 4	100	24 2 21	100
Cultivated before seeding only	18 1 3	17 3 15	19 3 25	18 2 24	97	21 0 3	85

Both the results of this year and the average results over the past 15 years are in favour of the plots cultivated in spring, after summer rains and before planting, though for this year the increase does not warrant the extra cost of so many cultivations.

FIELD EXPERIMENTS WITH WHEAT AND OATS, 1929.

AVONDALE STATE FARM.

A. S. WILD, B.Sc. (Agric.), Agricultural Adviser,
and
H. J. BAILEY, Farm Manager.

The land on which the wheat experiments were conducted was typical york gum and jam country which had been cleared a number of years. It had been ploughed during the previous July to a depth of four inches with a mouldboard plough, disced or springtyne cultivated during October according to the extent of the weed growth, springtyne cultivated in February, disced in April where necessary to destroy weeds, and again springtyne cultivated immediately prior to planting.

The monthly rainfalls as recorded at the farm, together with the average for the past 44 years as officially recorded at Beverley, four miles distant, are set out hereunder:—

	Jan.	Feb.	Mar.	Apl.	Growing Period.							Nov.	Dec.	Total for year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Avondale 1929.	...	109	77	15	256	434	228	123	73	36	1,150	198	7	1,556
Av. Beverley 44 years ...	31	44	64	85	220	319	326	246	166	97	1,374	49	39	1,686

The total rainfall for the year (1,556 points) was 130 points below the average for the past 44 years, and that for the growing period (1,150 points) was 224 points below the average. This was largely due to the low rainfalls during September and October. Fortunately excellent rains were experienced early in November, and consequently the crops matured as if under normal conditions.

RATE OF SEEDING EXPERIMENT.

In this experiment the midseason variety "Nabawa" was planted at three different rates, viz., 90 lbs., 45 lbs., and 60 lbs. per acre. The results obtained, together with the average percentage results for the past four years, are set out hereunder:—

RATE OF SEEDING EXPERIMENT, 1929.

Planted on 15th May. Variety—Nabawa. Superphosphate (22%)—100lbs. per acre.

Rate of Seeding.	Computed Yield per acre.										Average Yields per acre, 1929.		Percentage Yields, 1929.	Average Yields per acre, 1926-29.		Percentage Yields, 1926–29
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.							
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.		bus.	lbs.	
90lbs. per acre ...	32	13	27	13	27	57	28	11	29	24	29	0	112	21	41	113
45lbs. per acre (Control)	26	33	22	46	25	1	25	52	28	48	25	48	100	19	5	100
60lbs. per acre ...	26	11	30	15	26	41	27	5	26	4	27	15	106	20	18	106

The above results conclusively indicate that, under the conditions of growth at the Avondale State Farm, applications of seed heavier than 45 lbs. per acre are profitable. The results at the experimental farms situated in portions of the Wheat Belt, other than the Great Southern, are equally conclusive in establishing that 45 lbs. per acre of seed of the variety Nabawa is sufficient.

LIMING EXPERIMENT.

The object of this experiment is to ascertain whether an application of agricultural lime at the rate of 10 cwts. per acre is advantageous to the wheat crop.

This lime was applied a month prior to seeding, viz., on the 15th April, 1929. This procedure enabled the lime to commence its actions on the soil, and so, to an extent, safeguarded the superphosphate (applied at seeding) from undue interference, and consequent excessive "reversion." All plots were planted with the variety "Nabawa," and superphosphate was applied at the rate of 100 lbs. per acre.

The results obtained for this year, together with the average results for 1927-1929, are as hereunder.—

LIMING EXPERIMENT, 1929.

Planted 15th May. Variety—Nabawa. Seed—45lbs. per acre.

Superphosphate—(22%)—100lbs. per acre.

Lime applied.	Computed Yields per acre.						Average Yields per acre, 1929.		Average Percentage Yields, 1929.	Average Yields per acre 1927–29.		Average Percentage Yields, 1927–29.
	Section 1.		Section 2.		Section 3.							
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.		bus.	lbs.	
10 cwts. per acre ...	25	19	25	19	26	28	25	42	96	17	33	95
No Lime	26	18	25	8	28	37	26	41	100	18	32	100

These results, which are for three years, do not so far indicate that lime, when applied in the autumn prior to seeding to this class of soil, has a beneficial effect on the wheat crop.

NITROGEN EXPERIMENT.

The objects of this experiment are:—

1. To determine whether increased yields are obtained when heavy dressings of a nitrogenous fertiliser are applied to the wheat crop in addition to an application of superphosphate.

2. To ascertain whether it is advantageous to apply only part of the nitrogenous fertiliser at seeding time and part during the month of August.

For the purposes of the experiment two rates of sulphate of ammonia were applied, viz., 1 cwt. and 2 cwts. respectively.

Superphosphate was applied to all plots at the rate of 120 lbs. per acre, and those plots to which superphosphate only was applied were treated as controls. Comparisons were made between these control plots and those plots receiving 1 cwt. and 2 cwts. of sulphate of ammonia respectively. With each of these dressings the whole of the fertiliser was applied at the one time, viz., at seeding, in the one instance, and also, in separate plots, the application of half the sulphate was delayed until the month of August.

That portion of the experiment dealing with the application of 1 cwt. of sulphate of ammonia was repeated six times, while that portion dealing with the 2 cwts. of sulphate of ammonia was repeated four times.

This experiment was conducted on both fallowed and unfallowed land (york gum and jam country).

The fallowed land had been ploughed to a depth of 4 inches with a mouldboard plough during the month of July, 1928. During October it was springtyne cultivated and disced in February to destroy weed growth. Immediately prior to seeding in May it received a further springtyne cultivation.

The unfallowed land, which had been cropped the previous year, was ploughed to a depth of 3 to 4 inches on the 5th of June, planted the following day, and harrowed immediately after. Throughout the growing period the growth and colour of the plots treated with the sulphate of ammonia showed to considerable advantage. This was particularly so with the unfallowed land.

The results obtained are tabulated hereunder:—

NITROGEN EXPERIMENT, 1929.

FALLOW.

Planted 14th May. Variety—Nabawa. Seed—45lbs. per acre.

Superphosphate (22%)—120lbs. per acre.

Treatment.	Computed Yields per acre.												Average Yields per arce 1929.		Average percentage Yields, 1929.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5.		Section 6.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	%
½ cwt. Ammonium Sulphate at seeding ½ cwt. Ammonium Sulphate in August	25	35	26	4	27	2	21	27	24	22	*		24	54	98
No Ammonium Sulphate (Control) ...	26	19	25	6	25	35	25	6	25	6	*		25	26	100
Ammonium, 1 cwt., Sulphate at seeding ...	27	16	27	17	27	46	25	35	28	30	*		27	17	107
1 cwt. Ammonium Sulphate at seeding 1 cwt. Ammonium Sulphate in August	27	46	29	58	...		23	9	24	7	...		26	15	98
No Ammonium Sulphate (Control) ...	26	33	29	58	...		25	35	25	6	...		26	48	100
2 cwts. Ammonium Sulphate at seeding ...	28	0	30	28	...		26	48	27	17	...		28	8	105

*Portions of these plots were waterlogged and the results were therefore discarded.

NITROGEN EXPERIMENT, 1929.

Non Fallow.

Planted 5th June, 1929. Variety—Nabawa. Seed—45lbs. per acre.

Superphosphate (22%)—120lbs. per acre.

Treatment.	Computed Yields per Acre.												Average yields per acre, 1929.		Average percentage yields, 1929.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5.		Section 6.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	%
½ cwt. Ammonium Sulphate at seeding ½ cwt. Ammonium Sulphate in August	11	42	16	19	15	50	14	22	14	8	13	53	14	22	104
No Ammonium Sulphate (Control) ...	14	51	14	37	14	37	12	11	14	22	12	40	13	53	100
1 cwt. Ammonium Sulphate at seeding ...	16	19	16	48	17	3	13	9	15	21	14	22	15	30	112
1 cwt. Ammonium Sulphate at seeding 1 cwt. Ammonium Sulphate in August	19	0	14	22	...		16	34	13	53	...		15	57	110
No Ammonium Sulphate (Control) ...	14	8	15	21	...		13	53	15	7	...		14	37	100
2 cwts. Ammonia Sulphate at seeding ...	19	0	19	59	...		16	4	15	50	...		17	43	121

These results are not conclusive, but they indicate that on fallowed land of this type and in this district a slight advantage only is gained by applying a heavy dressing of a nitrogenous fertiliser to the wheat crop at seeding time. This advantage is lost if the application of portion of this fertiliser is delayed until August.

On the unfallowed land the indications are that the yields are increased to a greater extent than those on the fallowed land, and here again it is not advantageous to delay the application of portion of the nitrogenous fertiliser until the spring months.

OAT VARIETY TRIAL.

This experiment was conducted this year for the first time on the Avondale Farm. Five varieties were planted in each section, the standard late variety, Algerian, being taken as the control. The experiment was in triplicate, all three plots being harvested for grain.

The land was of a sandy nature, being originally timbered with sheoak and jam.

The results obtained are as follow:—

OAT VARIETY TRIAL, 1929.

Planted 13th May. Seed—40lbs. per acre. Superphosphate (22%)—100lbs. per acre.

Variety.	Maturity.	Computed Yields per acre.						Average Yield, 1929.		Average percentage Yield, 1929.
		Section 1.		Section 2.		Section 3.				
		bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	%
Burt's Early	Early	20	11	21	8	19	15	20	11	79
Algerian (Control) ...	Late	32	7	23	1	21	37	25	28	100
Guyra	Midseason ...	35	11	19	15	21	1	25	9	98
Lachlan	Midseason ...	26	12	17	37	15	36	20	2	76
Algerian (Control) [...	Late	32	7	23	1	24	12	26	20	100
Mulga	Early	*		18	4	19	37	19	1	70

*Results discarded owing to plot being affected by flood waters.

These results confirm those obtained at Wagin during 1927 (see "Journal," March, 1928, p. 85), viz., that the late variety Algerian and the midseason variety, Guyra, are the most suitable for grain in these districts.

THE STANDARD EGG.

W. T. RICHARDSON.

In the minds of a large majority of poultry farmers the production of standard-weight eggs—two ounces or over—appears to be a desirable object, but the methods adopted by them to reach that objective are as a general rule based on false premises. The trouble with most of them is that they have built up large flocks of birds at the expense of rate of laying coupled with grade of egg. The former calls for little knowledge and care compared with the latter, which is the result of years of careful selection in breeding, based on—

(1) constitutional vigour;
(2) body size;
(3) record of the individual performance of the breeding stock during the first laying season.

That the small-egg evil will, to a certain extent, always be with us is to be expected, given the recessive character of the "size-of-egg" factor in breeding. To-day that extent is too predominant in numbers of farms to be productive of satisfactory financial results, when considered from a purely egg-production point of view.

Constitutional vigour is indicated by the appearance, or build of the bird. Those without depth of body, width of body, and chest development lack in constitution; likewise the birds with sunken dull eyes, long snipy beaks, or with legs close together, especially at the hock, giving a "knock-kneed" appearance. The internal organs (digestive, reproductive, etc.) of a hen cannot function freely and to their full capacity if they are encased in a narrow, shallow frame. Heavy laying involves a severe strain on a hen or pullet, therefore a strong constitution is essential, otherwise a bird will be unable to stand up to the work, and not only will egg productions be seriously affected, but its health may be endangered. A vigorous constitution is closely connected with resistance to disease, both of which are inherited factors.

Any observant person may notice that undersized birds—in their respective breeds—are far too prevalent on our poultry farms. They indicate degeneration in body size, which is intimately associated with degeneration in the size of egg. Some farmers who a few years ago produced a preponderance of standard eggs find themselves to-day burdened with large quantities of undersized eggs, partly due to their disregard for body size when selecting the breeding stock.

Records of performance can only be obtained by single pen testing or trap nesting during the whole of the first laying season, when every egg laid should be individually weighed, and the weight recorded. Spasmodic attempts at testing for short periods will not indicate the performance of any bird at a later stage, either in size of egg or rate of laying. Pen averages are misleading because they do not single out the prolific layer from the possible poor layer. Weighing periods generally take place during July and/or August, and coincide with the peak period of production of standard eggs. They are not a guide to the breeding value of a bird, and create the impression that the average weight of egg shown for that period obtains for the rest of the test, irrespective of any variation in the size of egg. (See graphs in this and previous issues of the "Journal," also tables bearing on this subject.)

Generally, a hen does not attain her maximum egg size till she is in her third laying season. Most breeding operations are carried out with second and third season birds, any eggs out of the breeding pens not weighing the standard minimum (2 ozs.) being discarded. Discards are often heavy. The fact that poultry farmers generally incubate only standard eggs, expecting to obtain similar results from their flocks, is a clear indication, and justly so, that the credit "size of egg" with being an inherited factor. If their stud birds produced large quantities of undersized eggs in their first laying season, they must expect the progeny to show the same inherited tendency in their pullet season.

It does not necessarily follow that a pullet hatched out of a standard weight egg will be a producer of a large percentage of standard eggs. Possibly that particular egg may have been the only standard egg laid by its dam, or one out of a small percentage of them. We can only reasonably expect that the preponderance in size of egg in the parent stock, whatever that size may be, will be inherited by their progeny, with variations due to the recessive factor in the size of egg

A test, extending over two years, has been conducted at Muresk Agricultural College, under the supervision of the Poultry Keeper (Mr. S. Froome) to ascertain and compare the variation in grade of eggs laid by birds during their first and second season.

Independent of the Egg Laying Competition, a number of pullets are single pen tested at Muresk ever year. The feed and attention given them are identical with that of the competition birds. All eggs are individually weighed and the weight recorded. The test under review commenced on the 21st May, 1928. On 30th March, 1929, six White Leghorns that under test produced excessive numbers of eggs under 2 oz. were selected on their score card performance and again single pen tested for a further period of twelve months, i.e., to the 30th March, 1930, when the experiment terminated. Each graph indicates the performance of every individual bird during its first and second season. The black line designate standard eggs (2 oz. or over) and the dotted or broken lines the eggs under 2 oz. The progress of any of these birds in both grades of eggs can be followed by reference to the month (vertical columns) and the number of eggs laid (horizontal columns), according to the position of the respective discs. For example, Bird No. 140 (graph No. 2) laid two eggs 2 oz. or over, and 18 eggs under 2 two oz. during the month of October, 1928 (pullet season), whereas during the same period in 1929 (second season) it laid 21 eggs 2 oz. or over, and four eggs under 2 oz.

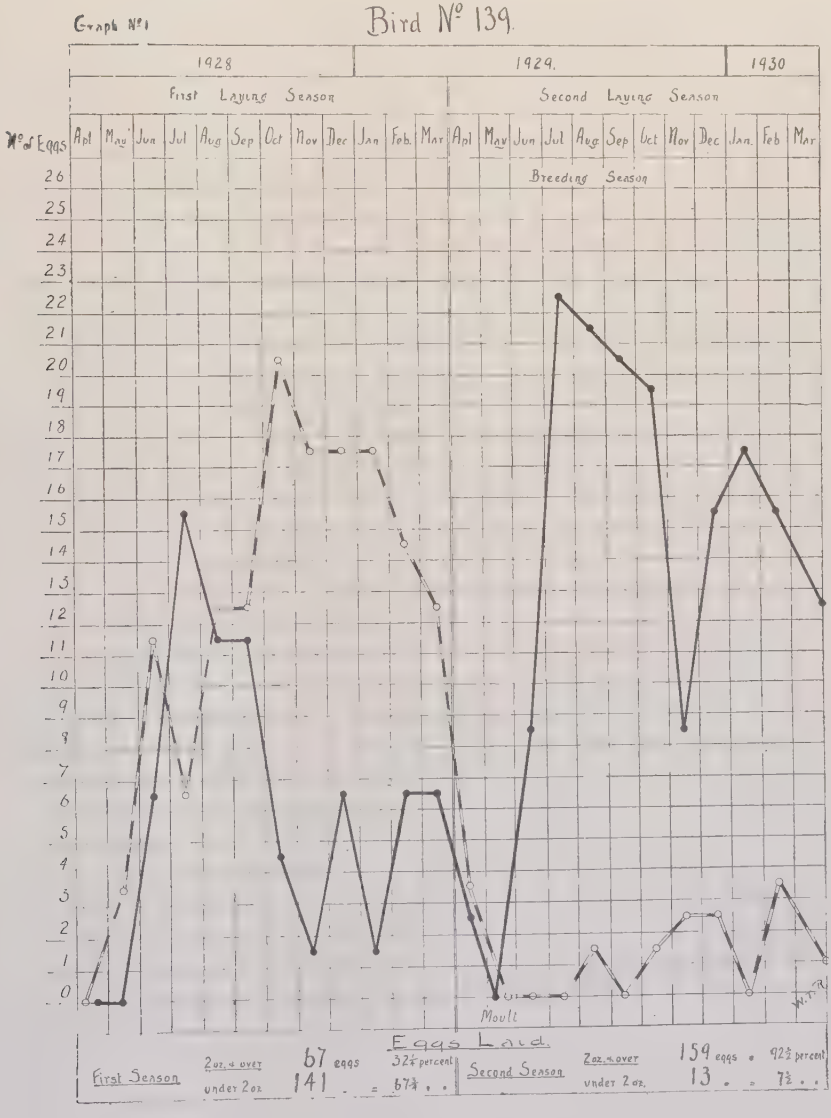
A test conducted privately has given similar results.

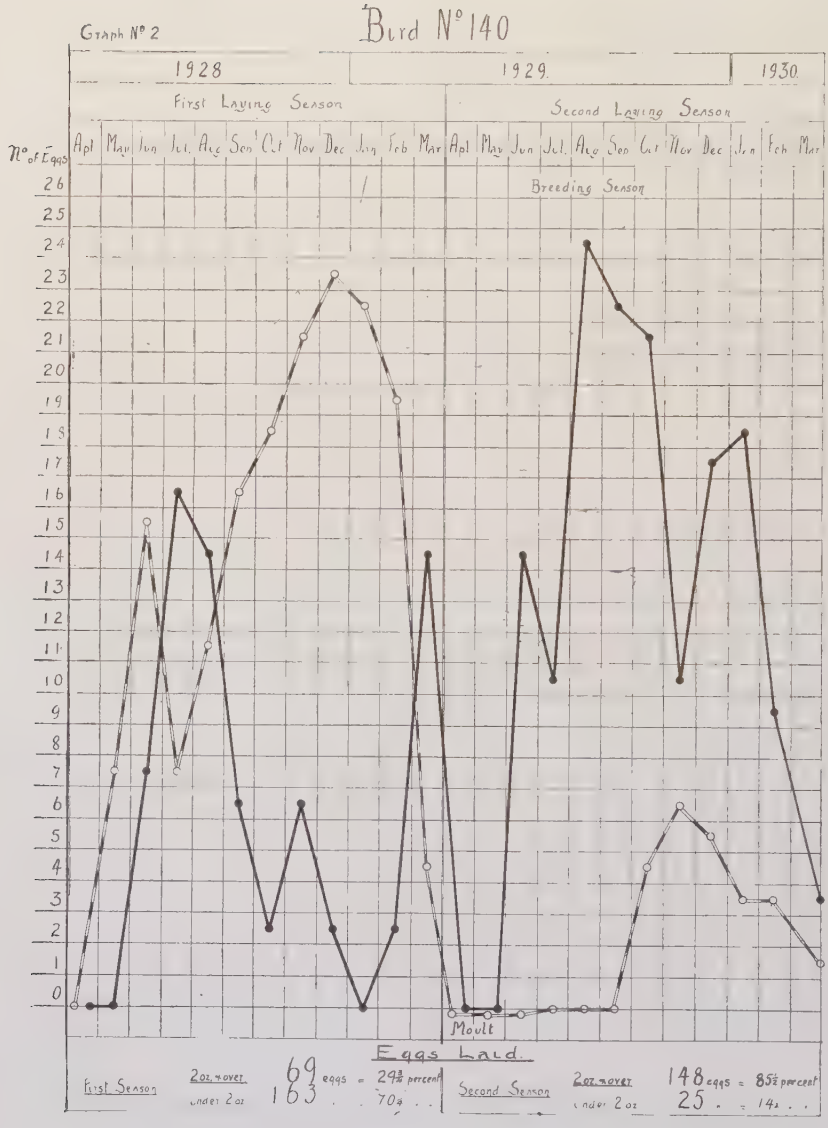
In the absence of any record of performance, hen No. 140 would appear to be a desirable breeder because during the breeding (second) season it laid 14, 10, 24 and 22 standard eggs in the months of June, July, August and September respectively, with a total absence of eggs under 2 oz. .

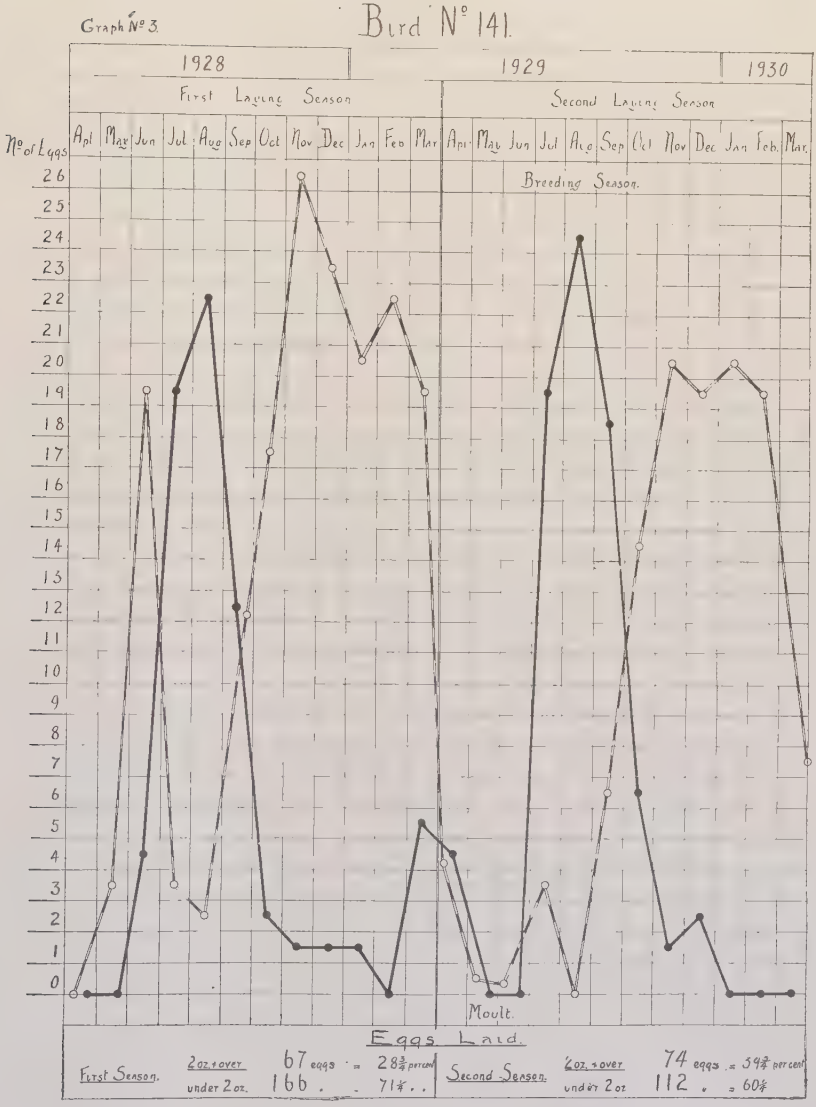
The above experiment indicates the unsoundness of the prevalent notion that to produce layers of standard eggs, all that is required is to fill the incubators with eggs weighing not less than 2oz. laid by birds in their second or third season.

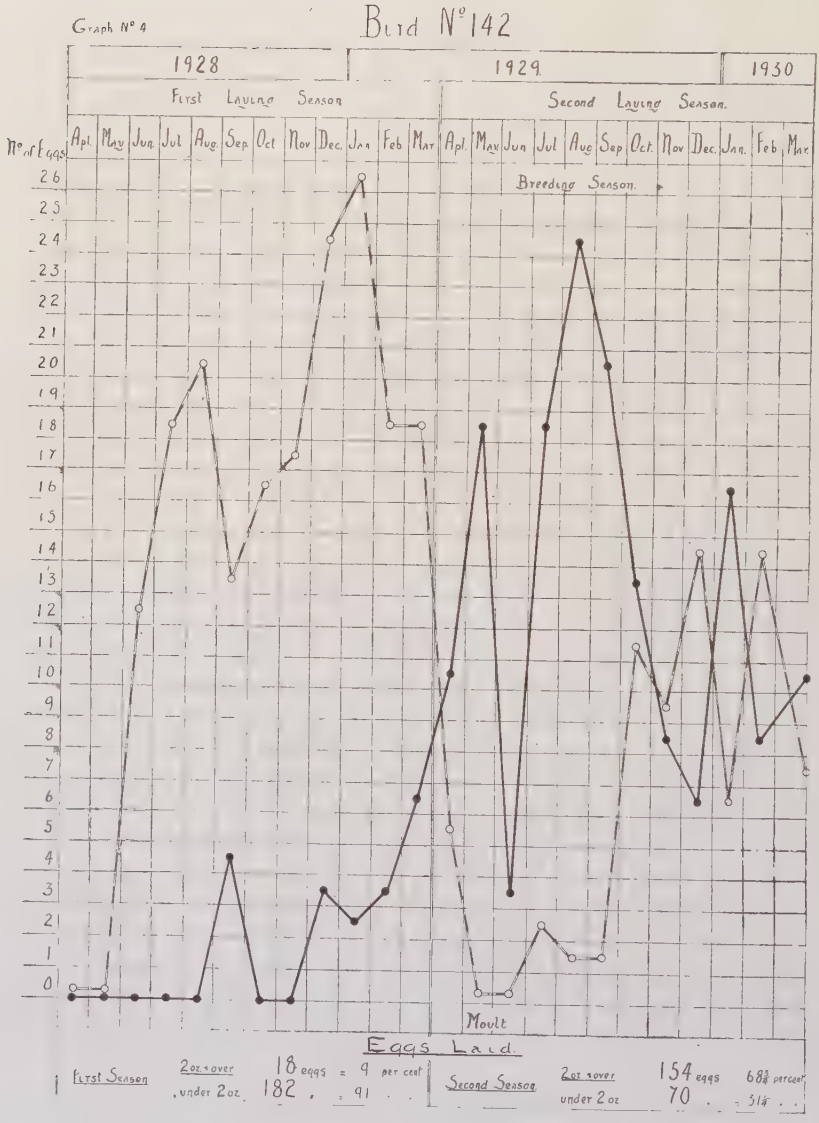
To produce and maintain the desired standard eggs, not only must the hens have produced a large preponderance of standard eggs in their pullet season, but the sire must be out of hen with similar characteristics.

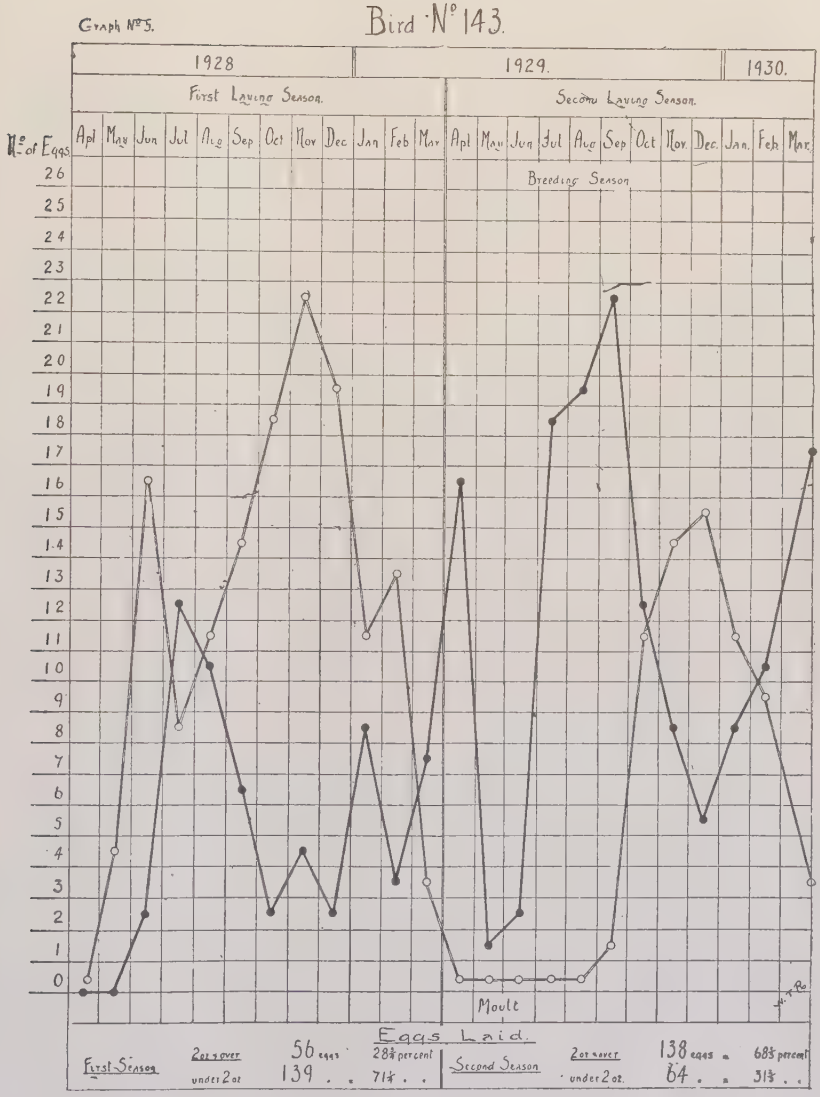
Results of an Experiment conducted at Muresk Agricultural College to determine the variation in grade of egg laid by Six Single Pen Tested White Leghorn Pullets during Two consecutive years.

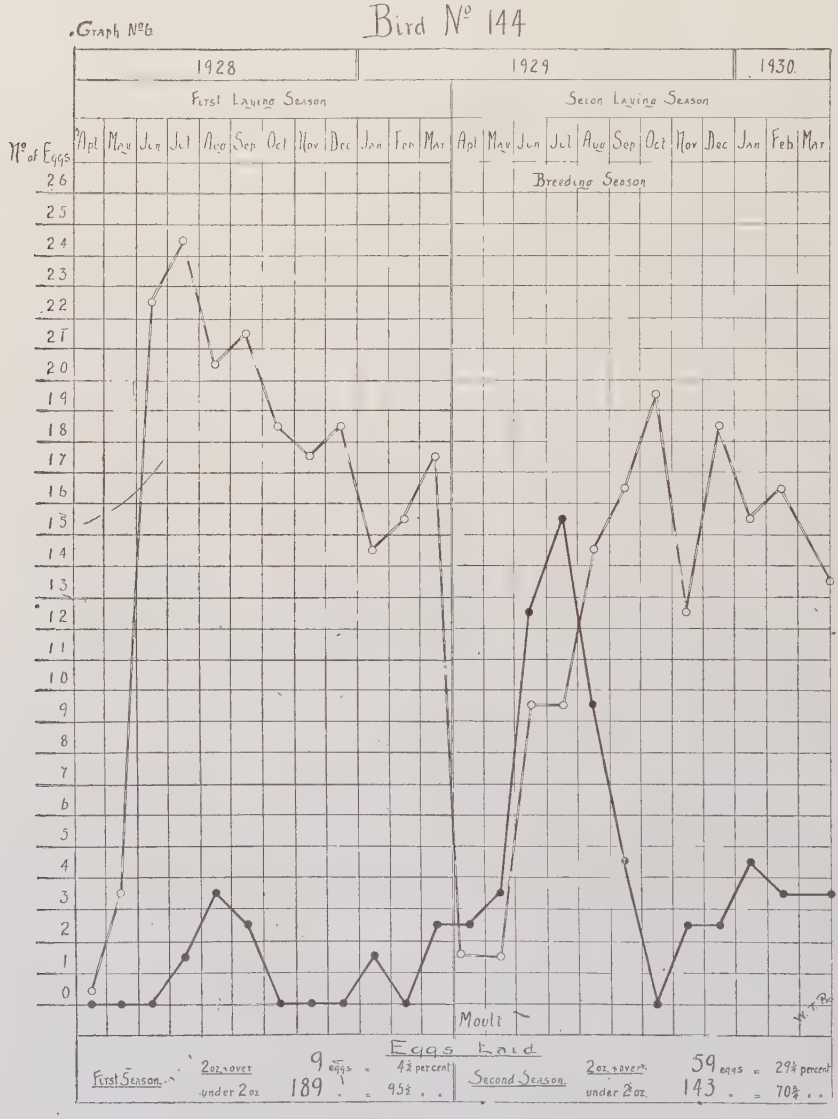

Graph No 1
Bird No 139.
1928
1929.
1930
First Laying Season
Second Laying Season
No of Eggs
Apl May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apl May Jun Jul Aug Sep Oct Nov Dec Jan. Feb Mar
Breeding Season
Moult
Eggs Laid.
First Season
2oz. & over 67 eggs 32½ percent
under 2oz. 141 . . = 67¾ . .
Second Season
2oz. & over 154 eggs . 92½ percent
under 2oz. 13 . . 7½ . .


Graph No 2
Bird No 140
1928
1929
1930
First Laying Season
Second Laying Season
No of Eggs
Apl May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apl May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Breeding Season
Moult
Eggs Laid.
First Season
2oz. & over 69 eggs = 24 9/16 percent
under 2oz 163 . . 70 3/4 . .
Second Season
2oz. & over 148 eggs = 85 1/2 percent
under 2oz 25 . . = 14 1/2 . .


Graph No 3.
Bird N° 141.
1928
1929
1930
First Laying Season
Second Laying Season
No of Eggs
Apl May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Apl May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Breeding Season.
Moult.
Eggs Laid.
First Season. 2 oz. & over 67 eggs = 28¾ per cent
under 2 oz. 166 " = 71¼ "
Second Season. 2 oz. & over 74 eggs = 39¾ per cent
under 2 oz 112 " = 60¼


Graph N° 4
Bird N° 142
1928
1929
1930
First Laying Season
Second Laying Season.
No. of Eggs
Apl. May Jun. Jul Aug. Sep. Oct Nov Dec. Jan Feb Mar Apl. May Jun Jul Aug Sep Oct. Nov Dec. Jan. Feb Mar.
Breeding Season.
Moult
Eggs Laid.
First Season 2oz & over 18 eggs = 9 per cent
under 2oz 182 . = 91 . .
Second Season 2oz & over 154 eggs 68¾ per cent
under 2oz 70 . . 31¼ . .


Graph No 5.
Bird No 143.
1928
1929.
1930.
First Laying Season.
Second Laying Season.
No. of Eggs.
Apl May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Apl May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Breeding Season
Moult
Eggs Laid.
First Season
2oz & over 56 eggs 28⅔ percent
under 2oz 139 . . 71⅓ . .
Second Season
2oz & over 138 eggs 68⅔ percent
under 2oz 64 . . 31⅓ . .


Graph No 6
Bird No 144
1928
1929
1930
First Laying Season
Secon Laying Season
No of Eggs
Apl May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Apl May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Breeding Season
26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Moult
W.T.B.
Eggs Laid
First Season. 2oz. & over 9 eggs = 4¾ percent
under 2oz 189 " = 95¼ "
Second Season. 2oz. & over 59 eggs = 29¾ percent
under 2oz 143 " = 70¼ "

CARE IN CRUTCHING.

H. McCallum,
Sheep and Wool Inspector.

There is a right way and a wrong way to crutch sheep. Great care should be exercised when handling pregnant ewes, and on no account should they be carried from the pen. Lead the sheep out, and be careful in turning them up. The wool should be taken off as closely as possible from a little below the hock, right round the top of the tail to where it joins on to the back bone and levelled outwards.

All dirt should be cut off so as not to attract flies. When crutching there is no necessity to lean on the sheep with the knee or to press heavily on the flank with the fist. On no account should the ewes in lamb be knocked about by rough handling, or jammed through gate-ways. The ultimate results of handling ewes roughly are premature birth, mal-formations and dead lambs.

CRUTCHING.

Correct method. Incorrect method.

Many flock owners crutch their high grade ewes in a standing position, one person holding the sheep and another handling the shears. By this method there is no possibility of the lamb being turned. The standing position may be much slower, but it is certainly the safest. Through neglect of crutching dirty sheep, before shearing, a considerable poundage of good wool is wasted on account of the large percentage of stained wool.

FERTILISERS.

The following fertilisers have been registered at the Department of Agriculture under the Fertilisers Act, 1928, up to and including 15th April, 1930:—

Name of Fertiliser.	Firm.	Brand.	Fertilising Ingredients.										Price per ton on rail at works or Perth.
			Nitrogen as—				Phosphoric Acid P_2O_5 as—				Potash K_2O as—		
			Nitrate.	Ammonia.	Blood and Bone.	Bone.	Water Sol.	Citrate Sol.	Acid Sol.	Total.	Sulphate.	Muriate.	
A.—MINERAL.													
1.—NITROGENOUS.			%	%	%	%	%	%	%	%	%	%	£ s. d.
(a)—Nitrogen-nitrate.													
Nitrate of Soda	Cumming Smith Mt. Lyell F.F. Co., Ltd.	Sickle	15·50	...	...	...	...	...	...	...	...	...	15 4 0
Do.	do.	ML in diamond ...	15·50	...	...	...	...	...	...	...	...	...	15 4 0
Do.	Cresco Fertilisers (W.A.), Ltd.	Cresco	15·00	...	...	...	...	...	...	...	...	...	16 10 0
Nitrate of Lime	do.	Cresco	15·50	...	...	...	...	...	...	...		...	16 0 0
Do.	J. A. Newman & Co.	BA over SF in circle	15·50	...	...	...	...	...	...	...	...	...	16 0 0
(b)—Nitrogen-ammonia.													
Sulphate of Ammonia ...	Cumming Smith, Mt. Lyell F.F. Co., Ltd.	Sickle	...	20·50	...	...	...	...	...	...	...	...	15 10 0
Do.	do.	ML in diamond ...	...	20·50	...	...	...	...	...	...	...	...	15 10 0
Do.	do.	CSML	...	20·50	...	...	...	...	...	...	...	...	15 10 0
Do.	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	20·00	...	...	...	...	...	...	...	...	15 10 0
Do.	Frank Viles ...	Imperial Chemical Industries	...	20·60	...	...	...	...	...	...	...	...	15 10 0
Do.	J. A. Newman & Co.	BA over SF in circle	...	20·60	...	...	...	...	...	...	...	...	16 0 0
Do.	C. Page & Co. ...	Page	...	21·00	...	...	...	...	...	...	...	...	14 10 0
(c)—Nitrogen—Miscellaneous.													
Calnitro	J. A. Newman & Co.	BA over SF in circle	...	20·50	...	...	...	...	...	...	...	...	16 0 0
Urea	do.	BA over SF in circle	...	46·00*	...	...	...	...	...	...	...	...	45 0 0
Floranid	do.	BA over SF in circle	...	46·00†	...	...	...	...	...	...	...	...	56 0 0

2.—PHOSPHATIC.													
(a)—Rock Phosphates.													
Pacific Islands Phosphate	Cuming Smith, Mt. Lyell F.F. Co., Ltd.	Sickle								36·65	36·65		4 11 6
Do.	do.	ML in diamond								36·65	36·65		4 11 6
Phosphate Powder	Cresco Fertilisers (W.A.), Ltd.	Cresco								34·80	34·80		4 10 0
(b)—Superphosphates.													
Florida Superphosphate 22 per cent.	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle					20·50	·50	1·00	22·00			4 10 0
High Grade Superphosphate, 22 per cent.	do.	ML in diamond					20·50	·50	1·00	22·00			4 10 0
Superphosphate, 22 per cent.	do.	CSML					20·50	·50	1·00	22·00			4 10 0
Florida Superphosphate, 24 per cent.	do.	Sickle					22·00	·50	1·50	24·00			4 15 0
High Grade Superphosphate, 24 per cent.	do.	ML in diamond					22·00	·50	1·50	24·00			4 15 0
Superphosphate, 24 per cent.	do.	CSML					22·00	·50	1·50	24·00			4 15 0
22 Superphosphate	Cresco Fertilisers (W.A.), Ltd.	Cresco					20·50	·50	1·00	22·00			4 15 0
24 Superphosphate	do.	Cresco					22·00	·50	1·50	24·00			5 0 0
46 Superphosphate	do.	Cresco					46·00			46·00			11 5 0
(c)—Rock Phosphates and Super.													
Phosphate Mixture	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle					10·00	1·00	18·00	29·00			4 11 6
Do.	do.	ML in diamond					10·00	1·00	18·00	29·00			4 11 6
50–50 Phosphate	Cresco Fertilisers (W.A.), Ltd.	Cresco					9·16	1·84	17·40	28·40			5 0 0
(d)—Basic Phosphate.													
Basic Phosphate	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle							17·00	17·00			4 14 0
Basic Phosphate	do.	ML in diamond							17·00	17·00			4 14 0
3.—POTASSIC.													
(a)—Potash-sulphate.													
Sulphate of Potash	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle									48·60		13 11 6
Do.	do.	ML in diamond									48·60		13 11 6
Do.	do.	CSML									48·60		13 11 6
Do.	Cresco Fertilisers (W.A.), Ltd.	Cresco									48·50		14 10 0
Do.	Dalgety & Co.	Stork									48·0		14 0 0
Do.	Dominions Potash Supply Co.	Sun (Diagram)									48·0		15 0 0

* As urea. † Complex combination.

FERTILISERS—*continued.*

Name of Fertiliser.	Firm.	Brand.	Fertilising Ingredients.										Price per ton on rail at works or Perth.
			Nitrogen as—				Phosphoric Acid P_2O_5 as—				Potash K_2O as—		
			Nitrate.	Ammonia.	Blood and Bone.	Bone.	Water Sol.	Citrate Sol.	Acid Sol.	Total.	Sulphate.	Muriate.	
			%	%	%	%	%	%	%	%	%	%	£ s. d.
(b)—Potash–muriate.													
Muriate of Potash	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle	...	...	...	...	...	...	...	...	...	50·40	12 1 6
Do.	do.	ML in diamond ...	...	...	...	...	...	...	...	...	...	50·40	12 1 6
Do.	do.	CSML	...	...	...	...	...	...	...	...	...	50·40	12 1 6
Do.	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	...	...	...	...	...	...	...	...	50·00	12 0 0
Do.	Dalgety & Co. ...	Stork	...	...	...	...	...	...	...	...	...	50·0	12 10 0
Do.	Dominions Potash Supply Co.	Sun (Diagram) ...	...	...	...	...	...	...	...	...	...	50·0	12 10 0
4.—NITROGEN AND PHOSPHORIC ACID.													
Nitro-Super.	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle	...	1·50	...	...	16·00	·40	2·10	18·50	...	...	5 9 0
Do.	do.	ML in diamond ...	...	1·50	...	...	16·00	·40	2·10	18·50	...	...	5 9 0
Ammonia and Phosphate ...	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	2·00	...	...	8·30	1·60	15·70	25·60	...	...	6 5 0
Do. No. 2 ...	do.	Cresco	...	3·02	...	...	15·00	·40	1·60	17·00	...	...	7 2 6
Diammonphosphat	J. A. Newman & Co.	BA over SF in circle	...	20·60*	...	...	53·00	...	...	53·00	...	...	40 0 0
Floraphos	do.	BA over SF in circle	...	20·60*	...	...	53·00	...	...	53·00	...	...	47 0 0
Special Potato Manure C. ...	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle	...	3·50	...	...	15·00	·40	1·60	17·00	...	...	6 19 0
No. 2 Potato...	do.	ML in diamond ...	...	3·50	...	...	15·00	·40	1·60	17·00	...	...	6 19 0
Potato Manure C.	do.	CSML	...	3·50	...	...	15·00	·40	1·60	17·00	...	...	6 19 0
Special Potato Manure F. ...	do.	Sickle	...	6·00	...	...	13·50	·40	1·60	15·50	...	...	8 9 0
No. 6 Potato...	do.	ML in diamond ...	...	6·00	...	...	13·50	·40	1·60	15·50	...	...	8 9 0
Potato Fertiliser X	Binney & Son ...	Swan	...	3·20	...	...	...	...	...	12·00	...	...	7 7 6
Do.	D. F. Carbarns & Co.	Crown	...	3·20	...	...	10·25	...	1·09	11·34	...	...	7 10 0

5.—NITROGEN, PHOSPHORIC ACID AND POTASH.

Special Potato Manure B. ...	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle	3·75	...	...	14·50	·35	·75	15·60	4·50	..	8	1 6
No. 3 Potato...	do.	ML in diamond	3·75	...	...	14·50	·35	·75	15·60	4·50	..	8	1 6
Potato Manure B.	do.	CSML	3·75	...	...	14·50	·35	·75	15·60	4·50	...	8	1 6
Special Potato Manure E. ...	do.	Sickle	3·50	...	...	14·00	·30	·70	15·00	8·00	...	8	16 6
No. 4 Potato...	do.	ML in diamond	3·50	...	...	14·00	·30	·70	15·00	8·00	...	8	16 6
Potato Manure E.	do.	CSML	3·50	...	...	14·00	·30	·70	15·00	8·00	...	8	16 6
Special Potato Manure G. ...	do.	Sickle	3·50	...	...	10·50	·20	·60	11·30	16·00	...	10	6 6
No. 7 Potato...	do.	ML in damond	3·50	...	...	10·50	·20	·60	11·30	16·00	...	10	6 6
Potato Manure G.	do.	CSML	3·50	...	...	10·50	·20	·60	11·30	16·00	...	10	6 6
Special Potato Manure H. ...	do.	Sickle	4·00	...	...	12·70	·30	·70	13·70	9·00	...	9	1 6
No. 8 Potato...	do.	ML in diamond	4·00	...	...	12·70	·30	·70	13·70	9·00	...	9	1 6
Potato Manure	Creso Fertilisers (W.A.), Ltd.	Cresco	1·50	...	...	7·10	1·40	13·50	20·00	7·50	...	7	12 6
Potato Special	do.	Cresco	4·00	...	...	12·50	·50	·75	13·75	8·75	...	9	10 0
Special Potato Fertiliser ...	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle	7·50	...	...	6·40	...	...	6·40	13·25	...	11	16 6
Do.	do.	ML in diamond	7·50	...	...	6·40	...	...	6·40	13·25	...	11	16 6
Potato Fertiliser	Binney & Son ...	Swan	3·20	...	...	...	...	...	12·25	4·00	...	8	12 6
Do.	D. F. Carbarns & Co.	Crown	3·20	...	...	10·25	...	2·00	12·25	4·00	...	8	15 0
Special Fertiliser	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle	8·25	...	...	8·05	·20	·39	8·64	10·00	...	12	1 6
Do.	do.	ML in diamond	8·25	...	...	8·05	·20	·39	8·64	10·00	...	12	1 6
Special Orchard Manure ...	do.	Sickle	2·00	...	...	14·00	·40	1·60	16·00	...	5·00	6	19 0
Do.	do.	ML in diamond	2·00	...	...	14·00	·40	1·60	16·00	...	5·00	6	19 0
Do.	Cresco Fertilisers (W.A.), Ltd.	Cresco	1·50	...	...	7·10	1·40	13·50	20·00	7·50	...	7	12 6
Nitrophoska N· 17·5 P_2O_5· 13·00 K_2O· 22·00	J. A. Newman & Co.	BA over S F in circle	17·5	...	...	13·00	...	...	13·00	...	22·00	23	0 0
Do. N· 15·00 P_2O_5· 11·00 K_2O· 26·50	do.	BA over SF in circle	15·00	...	...	11·00	...	...	11·00	...	26·50	23	0 0
Do. N· 16·50 P_2O_5· 16·50 K_2O· 20·00	do.	BA over SF in circle	16·50	...	...	15·20	1·30	...	16·50	...	20·00	23	0 0
Do. N· 16·50 P_2O_5· 16·50 K_2O· 21·50	do.	BA over SF in circle	16·50	...	...	15·20	1·30	...	16·50	...	21·50	24	0 0
Do. N· 15·50 P_2O_5· 15·50 K_5O· 19·00	do.	BA over SF in circle	15·50	...	...	15·00	·50	...	15·50	...	19·00	23	0 0
Garden Fertiliser	J. Ayre & Sons ...	Palm	5·25	...	...	11·90	...	...	11·90	...	8·56		†
Special Tomato Manure ...	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle	3·50	...	...	14·00	·30	·70	15·00	8·00	...	8	16 6
Do.	do.	ML in diamond	3·50	...	...	14·00	·30	·70	15·00	8·00	...	8	16 6
Do.	do.	CSML	3·50	...	...	14·00	·30	·70	15·00	8·00	...	8	16 6

* Complex combination. † Sold in small lots.

FERTILISERS—*continued.*

Name of Fertiliser.	Firm.	Brand.	Fertilising Ingredients.										Price per ton on rail at works or Perth.
			Nitrogen as—				Phosphoric Acid P_2O_5 as—				Potash K_2O as—		
			Nitrate.	Ammonia.	Blood and Bone.	Bone.	Water Sol.	Citrate Sol.	Acid Sol.	Total.	Sulphate.	Muriate.	
			%	%	%	%	%	%	%	%	%	%	£ s. d.
Special Market Garden Manure	Cuming Smith, Mt Lyell F.F. Co., Ltd.	Sickle	...	3·50	...	...	14·00	·30	·70	15·00	8·00	...	8 16 6
Do.	do.	ML in diamond ...	...	3·50	...	...	14·00	·30	·70	15·00	8·00	...	8 16 6
Vine Manure	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	1·50	...	...	7·10	1·40	13·50	20·00	7·50	...	7 12 6
Mixed Manure	do.	Cresco	...	1·50	...	...	7·10	1·40	13·50	20·00	7·50	...	7 12 6
6.—MISCELLANEOUS.													
Sulphate of Iron	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle	...	...	...	...	...	...	...	...	...	...	11 1 6
Iron Sulphate	do.	ML in diamond ...	...	...	...	...	...	...	...	...	...	...	11 1 6
Miticide Top-dressing ... *Fertiliser A.*	J. Ayre & Sons ...	Palm	...	...	...	...	...	...	15·0	15·0	...	...	*
Miticide Top-dressing ... *Fertiliser B.*	do.	Palm	...	...	...	...	...	...	19·0	19·0	...	...	*
B.—ORGANIC OR PARTLY ORGANIC.													
1.—ENTIRELY ANIMAL. *(a) Bonedust or Bonemeal.*													
Bonedust	Henry Wills & Co.	W in diamond ...	...	...	...	2·75	...	6·00	13·00	19·00	...	...	†10 0 0
Pure Bonedust	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	...	...	3·50	...	...	...	22·00	...	...	12 10 0
Steamed Bonedust	do.	Cresco	...	...	...	2·75	...	...	...	18·30	...	...	10 15 0
Bonedust, No. 1	Binney & Son ...	Swan	...	...	...	3·25	...	...	...	21·00	...	...	12 10 0
Bonedust Standard	do.	Swan	...	...	...	2·75	...	...	...	18·00	...	...	10 15 0
Bonedust	D. F. Carbarns & Co.	Crown	...	...	...	2·75	...	...	...	18·00	...	...	10 15 0
Bonedust Special, No. 1 ...	do.	Crown	...	...	...	3·50	...	...	22·00	22·00	...	...	12 10 0
Bonedust	W.A. Meat Exports Co.	Eclipse	...	...	...	3·50	...	...	22·00	22·00	...	...	12 10 0

(b)—Bone Fertiliser.													
Globe Bone Fertiliser ...	Binney & Son ...	Swan	...	2·00	...	...	...	18·00	...	...	8	15	0
Blood and Bone	W.A. Meat Exports Co.	Eclipse	6·00	...	...	...	12·00	12·00	...	...	13	5	0
Do.	Cuming Smith Mt. Lyell F.F. Co., Ltd.	Sickle	6·00	...	...	...	12·00	12·00	...	...	12	19	0
Do.	do.	ML in diamond	6·00	...	...	...	12·00	12·00	...	...	12	19	0
Do.	A. H. Hassell ...	Sun	5·25	...	...	4·50	8·50	13·00	...	...	13	0	0
Do.	Haynes & Clements	A1	5·25	...	...	3·00	9·00	12·00	...	...	13	10	0
Do.	E. M. Haywood ...	Cockbill	5·00	...	...	3·00	9·00	12·00	...	...	...		
Do.	State Abattoirs, Midland Junction	State Abattoirs, Midland Junction	6·00	...	...	...	9·00	9·00	...	...	12	10	0
B.B. Fertiliser	J. Tyler	Star	3·00	...	...	...	...	14·00	...	...	11	2	6
Do.	A. Richards ...	Vigor	5·00	...	...	...	...	14·00	...	...	11	2	6
Blood and Bone	Cresco Fertiliser (W.A.), Ltd.	Cresco	5·00	...	...	...	...	12·00	...	...	13	0	0
Do.	Binney & Son ...	Swan	6·00	...	...	...	...	12·00	...	...	13	0	0
B. & B. Fertiliser A. ...	do.	Swan	7·00	...	...	...	...	15·00	...	...	16	0	0
Do. B. ...	do.	Swan	6·50	...	...	...	...	12·00	...	...	13	0	0
Fish Fertiliser	do.	Swan	4·50	...	...	...	...	12·00	...	...	14	0	0
Blood and Bone	D. F. Carbarns & Co.	Crown	5·60	...	...	...	14·00	14·00	...	...	11	10	0
Do. A. ...	do.	Crown	7·00	...	...	...	15·00	15·00	...	...	16	0	0
Do. B.	do.	Crown	6·00	...	...	...	12·00	12·00	...	...	13	0	0
Do. ABC. ...	Paterson & Co. ...	Patco	5·25	...	...	3·00	9·00	12·00	...	...	13	0	0
Do. Globe ...	do.	Patco	5·00	...	...	...	...	9·00	...	...	‡		
Do. Moon ...	do.	Patco	5·00	...	...	...	...	9·00	...	...	‡		
Garden Fertiliser C. ...	Binney & Son ...	Swan	3·00	...	...	...	...	11·00	...	...	11	0	0
Do. D. ...	do.	Swan	1·7	...	...	...	...	8·30	...	...	8	10	0
2.—PARTLY ANIMAL.													
(a)—Nitrogen and Phosphoric Acid.													
Bone and Super	Cresco Fertilisers (W.A.), Ltd.	Cresco	2·00	...	9·50	3·90	3·00	16·40	...	...	7	17	6
Do. No. 1 ...	Binney & Son ...	Swan	...	1·37	...	...	...	17·50	...	...	6	0	0
Do. No. 2 ...	do.	Swan	...	·75	...	...	...	12·00	...	...	4	0	0
Do. No. 1 ...	D. F. Carbarns & Co.	Crown	...	1·37	8·00	...	...	8·00	...	...	8	0	0
Orchard Fertiliser	Paterson & Co. ...	Patco	...	5·00	...	...	12·00	12·00	...	...	12	10	0
(b)—Nitrogen, Phosphoric Acid and Potash.													
Orchard Fertiliser	Binney & Son ...	Swan	3·00	...	...	...	...	10·00	5·00	...	12	0	0
Special Potato (Bone basis)	do.	Swan	...	3·00	...	...	...	15·00	2·25	...	9	10	0
Bone Super. Potash... ...	do.	Swan	...	1·00	...	...	...	14·00	1·00	...	5	10	0
Do.	D. F. Carbarns & Co.	Crown	...	1·00	...	...	...	14·00	1·00	...	5	10	0

* Sold in small lots. † On rails Albany. ‡ Prices not yet available.

FERTILISER VALUES.

N. DAVENPORT, B.Sc., Agric.,
Inspector of Fertilisers.

The chief aim in cropping practice is, of course, to obtain the maximum yield of marketable produce per acre. To accomplish this end, it is usually found necessary to apply to the crop a fertiliser of a particular type. As a general rule there are several of that type available, and the question naturally arises as to which is the most economical.

This is a question which is repeatedly asked by the farmer who keeps an accurate account of his costs of production and is careful against incurring unnecessary expense in his farming operations.

It would seem, at first, that a comparison of the costs per ton would be a sufficient guide. This is not so, however, as the registered minimum percentages of nitrogen, potash, etc., in each fertiliser are very seldom identical.

A system is in use, viz., that of units and unit values which enables an approximation of the comparative values of similar fertilisers to be made.

The majority of the fertilisers in use in this State are those which contain nitrogen, potash, and phosphoric acid, these constituents being known as *fertilising ingredients*. The amount of a fertilising ingredient in a fertiliser, *e.g.*, say nitrogen in sulphate of ammonia, is measured in terms of units, *a unit being one per cent. by weight in the ton*. Therefore, a sulphate of ammonia fertiliser with a guarantee of 20 per cent. of nitrogen contains 20 units of nitrogen per ton. If we contine further and say that the price of that ton is £15, then the price of 20 units is £15. Therefore, the price of one unit is $£\frac{15}{20}$. *In other words, the unit value of nitrogen as sulphate of ammonia is* 15s.

In a similar way, the unit values may be obtained of other fertilising ingredients in their various forms. It must clearly be understood that the unit values are governed by market rates and are not to be considered as a definite measure of the agricultural or fertilising value of the respective fertilising ingredients. These unit values, however, approximate fairly closely to the fertilising value, as where the price is abnormally high, the demand diminishes, with a resulting fall in price and a corresponding lowering of the unit value.

Unit values should be used only in comparing fertilisers of similar type, as manufacturing costs vary greatly with the class of fertiliser as also do the length of time and extent to which the fertilising ingredients become available.

Having arrived at all necessary unit values, we can then decide between two manures for which we have been quoted, say—

	Guaranteed Nitrogen.	Minimum Percentages Phosphoric Acid.	Quoted price per ton.
			£ s. d.
Cab Brand Blood and Bone ...	6·5	10	14 0 0
Car Brand Blood and Bone ...	5·5	13	14 0 0

As will be seen from the appended table of unit values for 1930, that for nitrogen in blood and bone is 32s. and for phosphoric acid in blood and bone is 6s. 6d. Using these figures, we now obtain the computed value of each fertiliser, based on the fertilising ingredients which it contains

CAB BRAND BLOOD AND BONE.

6·5 units of Nitrogen at 32/- per unit	208/-
10 units of Phosphoric Acid, at 6/6 per unit	65/-
Total value	273/-

CAR BRAND BLOOD AND BONE.

5·5 units of Nitrogen at 32/- per unit	176/-
13 units of Phosphoric Acid, at 6/6 per unit	84/6
Total value	260/6

It will be seen, therefore, that as the units contained in the Cab Brand are worth more than those of the Car Brand, the former would be the more economical fertiliser to purchase when they are both priced at £14 per ton.

The total of the unit values of each fertiliser is not necessarily equal to the market price, as the values themselves are averages of all the fertilisers of that class on sale.

In mixed mineral fertilisers, also, the cost of mixing and extra handling must be added to the cost of the ingredients which thus makes the unit values of fertilising ingredients of mixed fertilisers higher than those in simple manures.

The following table gives the list of unit values for 1930:—

UNIT VALUES FOR 1930.

NITROGEN.

as Blood and Bone, Bonedust, and Bone and Flesh ...	32–0
,, Nitrate	20–6
,, Urea	19–6
,, Ammonia	15–3

PHOSPHORIC ACID.

as *Water Soluble*	4–2
as *Citrate Soluble*—	
in Blood and Bone, Bonedust, and other animal fertilisers	6–6
In other fertilisers	4–2
as *Acid Soluble*—	
in Blood and Bone, Bonedust, and other animal fertilisers	6–6
,, Basis Phosphate	5–6
,, Ammonia and Phosphate	3–4
,, Superphosphate and Rock Phosphate	2–6
,, Other fertilisers	1–0

POTASH.

as Sulphate	5–6
,, Muriate	4–10

THE POLLINATION OF ORCHARDS.

H. WILLOUGHBY LANCE,
Apiculturist.

An article appeared in this Journal for December, 1927, showing the results of experiments dealing with the pollination of prune trees by bees.

It is greatly to be feared, however, that orchardists do not realise the importance of the presence of bees in their orchards; or if they do realise it, they are either content with the crop they have, are too much afraid of the handling of bees, or have not enough energy and enterprise to arrange for the installation of these most important agents in the fertilisation of their trees. Experiments in America during the last few years have brought home to the orchardist the importance of bees as fertilising agents, so much so that it is quite common for hundreds of hives of bees to be transported to orchards for the blossoming period and the bee-keeper to be well paid by the orchardist for so doing. Other orchardists are studying bee-keeping and adding honey production to their activities.

Generally speaking, orchardists in this State do not realise the importance of having bees on the spot and on the right spot. It is not enough to have bees in the bush. Very often at blossoming time the weather is cold, cloudy, or showery. At such times bees in an orchard will slip out during intervals of sunshine, while bees in the bush will not be tempted out, or will not have the time to reach the orchard.

Of course other agencies besides bees are necessary for the pollination of blossom. The wind, some classes of birds, and indigenous insects, all have their part to play in the pollination of wild flora, but it is nevertheless true that modern fruit culture requires the special agency of the honey bee.

A. I. Root, of Medina, U.S.A., says:—"In sections where immense orchards cover many square miles of territory and fruit is grown by the ton and car load, the wild insects are wholly indaquate to pollinate the great expanse of bloom and many apiaries must be established to obtain the best results. The only pollinating insects under the control of man are honey bees, and these must be introduced in large numbers in order to make fruit-growing commercially profitable. Fruit growing has a marvellous future before it and must be associated with bee culture."

In the "Agricultural Journal" of December, 1927, we gave particulars of experiments carried out in California on the setting of the fruit of prune trees. A summary of this shows the immense value of bees. The orchard in which the test was made covered 180 acres. In 1916 there were no hives of bees in the orchard, but in 1917 there were 115. Trees were enclosed so as to exclude bees, other trees were enclosed so as to enclose bees. The result was as follows:—

	1916.	1917.
	No Bees.	Bees.
Set of tree from which bees were excluded ..	1.04	0.43
Average set of orchard, unenclosed	3.59	13.2
Set of tree with bees enclosed	18.05	19.0

It will be noted that the average setting with no bees in the orchard in 1916 was 3.59, and that this was increased to 13.2 in 1917, when the hives had been placed in the orchard.

Since this date many experiments have been made in relation to the pollination of fruit trees; and in many orchards of self sterile trees, it has become the practice to place bouquets of bloom from another variety in proximity to the self sterile trees, and to place hives of bees in the orchard for their fertilisation.

Orchardists must realise that it is not sufficient to have a hive of bees in the vicinity of the orchard. The hive must be in the right position. It must also be in the right condition at blossoming time and if necessary the orchardist must assist the bees by placing bouquets of fresh blossom in their line of flight that they may visit these first and carry the pollen with them to the trees. In other words, the orchardist must understand and look after his bees just as much as his trees.

To get the best results from bees in an orchard, they should be in full strength at blossoming time. This in some districts may mean feeding the bees about five weeks previously to induce rapid breeding and ensure a large field force when the blossoms are out.

As soon, therefore, in the spring as the weather allows, all hives should be opened up to see the condition and make sure that there is a good breeding queen, plenty of stores, both honey and pollen, also plenty of room for egg laying. If there is plenty of honey in the hive, but none being gathered some of it should be uncapped to induce the commencement of brood rearing.

A good book that can be recommended to the small bee-keeper is "The Beginner in Bee Culture," by W. A. Goodacre, issued by the New South Wales Department of Agriculture, post free 1s. 1d.

As a rule bees, when they leave the hive, seem to know just where they are going, and strive to arrive there in the shortest possible time. While there is nectar and pollen to be gathered from blossom, bees will absolutely ignore even honey placed on the ground a few feet away from the hive. For this reason, it has been noted that "tub bouquets" placed on the ground in front of the hives in many orchards have failed to give the desired results. The bees seem to have the trees in mind, and fly right over the tempting supply of nectar and pollen without stopping to investigate.

Messrs. Kremer and Hootman, in "Gleanings in Bee Culture," give some interesting facts about practical work with colonies of bees and bouquets in orchards and the following is an extract therefrom:—

Proper Placing of Bouquets.

"Realising that the placing of the bouquet on the ground often defeated the object desired—namely, enticing the bee to visit the blossoms on its way to the field, a better method or one that called for the placing of the bouquets in the line of flight between trees was tried in a limited area in both a McIntosh and a Northern Spy orchard this past year. The "set" of fruit in each case was increased from 10 to 14 per cent. by using this method.

"On cool or windy days the bees show a preference for the blossoms on the sunny side of the trees. Unless the temperature is sufficiently high to induce the bees to fly freely around the tree, the majority of the fruit will be on the sunny side.

When the bouquets were placed in pails of water and hung on tripods between the trees in the line of flight, the bees visited the blossoms of the bouquets as readily as those of the tree. When bouquets were suspended from a limb of the tree in the shade, and the weather was somewhat cool, the

bees were disinclined to enter the shady area with the result that the bouquet did not prove entirely efficient in that position.

Several counts made of the visit of bees to the bouquets in different positions under the same weather conditions revealed that the bouquets placed in the line of flight of the bee when it has begun its search for nectar or pollen received at least five times as many visits per minute as a bouquet in any other position."

Bees Double Fruit Crop.

For pollination purposes, the importance of distributing the colonies through the orchard during the blossoming period must be carefully considered. The experience this past season of Frank Street, Manager of the Kentucky Cardinal Orchards, of Henderson, Kentucky, well illustrates this point.

On the strength of facts brought out in a recent pollination publication, he placed 50 colonies of bees in a 45-acre tract of Winesaps, in which the pollinating variety was Champion, this variety being planted every third tree in every third row. The bees were placed about ten feet away and facing the pollinating variety.

They had two other tracts of orchard of about equal producing capacity, located six and eight miles from the orchard under discussion. The following are the harvesting records on these three orchards from September 15 to October 15. The varieties in the main are Winesap, Stayman, Delicious, Ben Davis and Champion.

The bees were distributed in the Green Farm Orchard at the rate of about one colony to the acre, as indicated above. The other orchards were situated near colonies of bees, but no bees were placed directly in the orchard. The Park Orchard, on which the pollination appeared the poorest, was within 2,000 feet of a commercial apiary, but the bees had to cross a wind swept valley to reach the orchard. Rain and high winds interfered with their normal flight during the bloom.

Farm.	Hand picked.	Drops.	Total bu.
Park Orchard	5,661	3,800	9,461
Home Farm	5,839	3,060	8,899
Green Farm (bees) ..	14,381	2,872	17,253

In the table above, we would like to call attention to the fact that from pollination the number of bushels of drops or ground fruit was not only reduced, but the total yield was nearly doubled. Did it pay to distribute the colonies through the orchard?

Location in Orchard Important.

To assure sufficient insect activity under adverse weather conditions at blossoming time, strong colonies of bees should be distributed in mature orchards at the rate of about one colony to the acre. Bee flight will be encouraged and better results obtained by locating the colonies in sunny wind-sheltered locations, away from exposed locations swept by strong winds. When wind is blowing over 20 miles an hour, cross currents and eddies are created among the trees which are avoided by the bees. These conditions are unfavourable to the bees, and their flight under such conditions is greatly reduced.

Distributing the colonies through the orchard will provide for the most economical utilisation of any flight that is made. For pollination purposes, the place for the colonies during blossom time is in or very near the orchard, not in an apiary a half mile or more from the orchard.

NUNGARIN AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1929/30.

Judge—H. Rudall, Field Officer.

Nineteen entries were received for the Fallow Competition conducted by the Nungarin Agricultural Society. Thirteen of these submitted their fallow for adjudication. The judging was based on the same scale of points as in previous competitions, namely:—

	Points.
Moisture	40
Condition of mulch	10
Freedom from weeds	10
Consolidation of seed bed	20
Uniformity of preparation	20
Total	100

Judging was commenced on the 17th March and completed on the 20th. A fairly general thunderstorm fell over most of the area about 10 days before judging took place.

The rainfall recorded at various centres from June until 20th March is shown hereunder:—

	Fallowing rains.				Spring rains.			Summer rains.						Total Rainfall June to 20th March.
	June.	July.	Aug.	Total.	Sep.	Oct.	Total.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	
Nungarin ...	249	104	86	439	14	55	69	225	...	...	24	177	426	934
Creagh Bros.	240	105	71	416	15	65	80	181	...	...	11	130	322	818
Lake Brown	153	54	59	266	15	53	68	205	...	...	...	84	289	623
Talgomine Downs	269	70	68	407	14	72	86	204	...	...	15	218	437	930
Jolly, J. ...	246	66	88	400	21	99	120	288	...	...	...	166	454	974

The competing areas of fallow which were outstanding were those submitted by Mr. H. P. Jolly and Mr. F. A. Williams.

Mr. Jolly's was long summer fallow, ploughed in February, and subsequent working and implements were such that, with the turf-like feeling underfoot, one felt and ultimately found a mulch of desirable tilth and depth, with a level and well consolidated seedbed, without clods being buried. The moisture content was high at a depth from 8 to 12 inches.

Mr. Williams' competing plot might have shown more uniformity in preparation if a plough had been used for the initial operation, followed by the springtyne cultivator and harrows in November. The uneven depth of the initial working (scarifying) was more pronounced than in Mr. Jolly's. The consolidation was a little too firm and the moisture content was not as pronounced at the same depth as the successful competitor.

With these two entries of such a high standard, my task was made easy when examining the other entries.

The following table summarises the cultural methods and shows the points awarded:—

Competitor and District.	Original Timber.	Rotation.	Time of Fallowing.	Type of Plough.	Depth of Ploughing.	Condition of Land at time of Ploughing.	If Sheep fed.
					ins.		
Jolly, H. P. Mangowine ...	Salmon and Gimlet ...	Crop and fallow ...	February ...	Disc (sundercut) ...	3½	Good	Yes
Williams, F. A. Mangowine ...	Salmon, Gimlet, Mallee ...	do. ...	June ...	Duckfoot scarifier ...	3½	Good	Yes
Creagh Bros., Kwelkan	Gimlet, Mallee, Jam ...	do. ...	June ...	Disc	4	Good	Yes
Dumsday, L., Talgomine ...	Salmon and Gimlet ...	do. ...	July ...	Disc	3½	Good	No
Fitzpatrick, R. C., Nungarin ...	Salmon, Gimlet, Morrell ...	do. ...	July ...	Disc (sundercut) ...	3½	Good	No
Jolly, J., Mangowine	Yorrell, Tea-tree, Morrell, Salmon and Gimlet	do. ...	July ...	Skim	4	Good	No
Goode, H. E., Mangowine ...	Salmon and Gimlet ...	do. ...	June ...	Disc (sundercut) ...	3	Good	No
Duthie, W. J., Mukinbudin ...	Mallee, Jam Scrub ...	do. ...	May ...	Disc	3½	Good	Yes
Mulqueeny, J., Lake Brown ...	Salmon and Gimlet ...	do. ...	June ...	Disc (sundercut) ...	3½	Good	No
Hocking, F., Nungarin	Salmon, Tea Tree, Mallee ...	do. ...	July ...	Disc (sundercut) ...	3½	Good	No.
Watson Bros., Nungarin... ...	Salmon and Gimlet ...	do	July ...	Disc (sundercut) ...	4	Good	Yes
Dawe, F. J. W., Nungarin ...	Morrell, Salmon, Gimlet ...	Two crops and fallow	June ...	Disc	3½	Good	No
Stockdale, Mrs., Talgomine ...	Mallee, Jam, Salmon and Gimlet	First fallow	July ...	Disc	3½	Good	No

Competitor.	Cultivations.	Moisture.	Mulch.	Absence of Weeds.	Consolidation.	Uniformity of Preparation.	Total.
Jolly, H. P.	Skim M.B., June, springtyne and harrowed end July and end of August. Sundercutted (disced) and harrowed September. Harrowed March	37	9	9	19	19	93
Williams, F. A.	Scarified (duckfoot) and harrowed September. Scarified and harrowed November. Harrowed March	36	9	9	18	18	90
Creagh Bros.	Sundercutted (disced) August, springtyned November, combined (cultivator drill) March	34	8	9	18	17	86
Dumsday, L.	Cross ploughed July. Portion scarified (duckfoot) and portions springtyned October and November. Combined (cultivator drill) March	34	8	9	18	17	86
Fitzpatrick, R. C.	Cross sundercutted (disced) in August. Combined (cultivator drill) November, and in March	34	8	9	18	17	86
Jolly, J.	Skim ploughed September and harrowed. Springtyned November. Harrowed March	34	8	9	18	17	86
Goode, H. E.	Springtyned and crossed in July. Sundercutted (disced) and harrowed November	32	7	8	17	17	81
Duthie, W. J.	Springtyned in August and harrowed November	32	7	8	17	17	81
Mulqueeny, J.	Skim ploughed in July and August. Harrowed and portion springtyned in November	32	7	8	17	17	81
Hocking, F.	Sundercutted (disced) August. Sundercutted September. Combined (cultivator drill) October. Sundercutted November	32	7	8	17	17	79
Watson Bros.	Skimmed with sundercut September. Harrowed March	32	7	8	16	15	78
Dawe, F. J. W.	Skim ploughed in September. Sundercutted (disced) November ...	30	7	8	15	15	75
Stockdale, Mrs.	Springtyned and harrowed August. Rolled and harrowed September. Springtyned and harrowed November. Springtyned February	30	6	7	15	15	73

Perusal of the recorded rainfall at the various centres shows that the spring rains were very light. In November a heavy downpour occurred. This falling at harvest time was perhaps most inopportune because time and labour may have only permitted the whole of the acreage fallowed being rushed over. Had attention been concentrated on a portion, and this thoroughly worked to conserve all the moisture possible, some of the fallows examined would have then shown more moisture below the depth of ploughing which would be available for the depleted subsurface soil. In many cases for this cultivation the sundercut and combine-cultivator-drill were used in an endeavour to form a suitable mulch. The former implement (sundercut) gave too great a depth of mulch with numerous air pockets caused by covered clods which provided many exaporating tubes, and with the latter machine (combine cultivator-drill) more care might have been exercised in regulating the depth, thereby avoiding a mulch almost to the depth of ploughing. The March rains were most valuable to those fallows worked properly; but again the sundercut and combine-cultivator-drill were providing a mulch of too great a depth.

It would be well if more farmers realised the value of the March and April rains and the necessity for the immediate cultivation of the fallow to restore the mulch which will assist to conserve as much moisture as possible, as an insurance against a late starting or a light winter's rainfall. This is supported by Departmental records of the Demonstration Plots at Kalgoorlie in 1927. Five inches of rain were recorded during March. The soil was immediately worked. No further rains were experienced until May, when the seed was sown. Three and a-half inches were recorded during the growing period, and the very early variety Noongaar returned 25 bushels to the acre.

Experiments have proved that the more moisture conserved on the fallowed land in the Eastern Wheat Belt means better fallow, and better fallow means bigger yields.

It is nearly four years since my last visit to this district, and some of the fields when first taken up were cropped continuously for some years, followed later by a fallow-wheat rotation. It was noticed in some instances on the heavier soil that there was a most decided lack of compaction of the surface soil. This is more noticeable after a season of light rainfall than after an average one. It occurred to me that a timely warning might be sounded that perhaps the fallow-wheat rotation is being continued a little too long, thereby impoverishing the soil by depleting the humus which is so necessary to maintain its fertility. Now that many farmers have the water available on their holdings, through the reticulation from the rock catchments, and are able to run sheep, it might be advisable to consider a longer rotation, so as to include a pasture or fodder crop which would be beneficial in assisting to restore the humus so necessary to the fertility of the soil.

OAT VARIETY TRIALS AT DENMARK.

J. T. Armstrong, B.Sc. (Agric.),
Senior Agricultural Adviser.

Last year several Oat Variety Trials were conducted in the Denmark district, using the varieties Burt's Early, Lachlan, Guyra.

The growth of "Lachlan" and "Guyra" was similar until September, when "Lachlan" forged ahead of the latter variety and eventually yielded considerably better.

It is considered that, if the crop is to grow through the winter, the soil should be left cloddy and open so as to permit of better aeration. This was shown on Mr. Russell's plot, where the mulch was worked too finely, and the soil became cold and water-logged in the winter. Where the crop is grown for early feed, the mulch should be made very fine.

The experiment shows that for early winter and spring feeding, "Lachlan" is the best of these three varieties in this district.

The following are the details of the trials:—

E. Russell, Group 42, *Denmark.*

Soil—light brown friable loam previously growing maize which was cut in February. On account of the friable nature of the soil, the lower plots became cold and water-logged in the winter, and sections were consequently only cut from plots on higher land.

Cultivation. Land was ploughed and harrowed four times prior to seeding.

Seeded: 21st March, 1929,
Rates: Seed, 1 bushel oats per acre.
Superphosphate, 2 cwts. per acre.
Seed and manure harrowed in.
Harvested first week in November, 1929.
Yields: "Guyra"—3 tons 12 cwts.
"Lachlan"—4 tons 6¼ cwts.
"Burt's Early"—2 tons 17½ cwts. per acre.

F. Smith, Group 41, *Denmark.*

Soil—red karri loam, rocky in places.

Cultivation. Cleared in December, 1928, ploughed with share plough in January, 1929, then disc cultivated and reploughed early in February, 1929, and harrowed twice.

Seeded: 20th March, 1929.
Rates: Seed, 50 lbs. oats per acre.
Superphosphate, 2 cwts. per acre
Yield: "Guyra"—3 tons 12 cwts.
"Lachlan"—5 tons 8 cwts.
"Burt's Early"—4 tons 7½ cwts.

K. Testar, Group 100, *Denmark.*

Soil—red loam varying to lighter sandy loam, carrying originally jarrah and red gum.

Cultivation. Cleared December, 1928. Ploughed December, 1928, re-ploughed in January, then harrowed twice, and harrowed twice with tyne harrows.

Seeded on 26th March, 1929.

Rates: Seed, 1 bushel oats per acre.
Superphosphate, 2 cwts. per acre.

Harvested at end of October.

Yield: "Lachlan"—3 tons 10 cwts.
"Guyra"—3 tons 1 cwt.
"Burt's Early"—3 tons 1 cwt.

The following are the average yields from the three plots:—

	Per acre.		Percentage Yield.
	tons.	cwts.	
"Lachlan"	4	8	100
"Burt's Early"	3	9	78
"Guyra"	3	8	78

A COMPARISON BETWEEN OATS AND CAPE BARLEY FOR EARLY WINTER FEED.

Last year an experiment was conducted on Group Settlement holdings at Denmark, comparing the suitability of oats and Cape barley for early winter feed. "Burt's Early" was the oat variety used.

The experiment proved that, on reasonably good country, "Burt's Early" oats will give earlier and more feed than Cape barley, and stock prefer the oats to the barley.

In this district the land should be ploughed in the summer, and seeded in February, either with "Burt's Early" or "Lachlan" oats.

The following are the details of the experiment:—

J. Ilsley, Group 41.

Soil: Medium to light loam, growing in its virgin state karri and sheoak.

Cleared in January, 1929, ploughed with share plough in February, re-ploughed, disc cultivated and harrowed four times and again after seeding.

Seeded: 25th March, 1929.

Rates of Seeding: 1 bushel oats, 1 bushel barley per acre.

Fertiliser: 2 cwts. superphosphate per acre.

The crop was fed off on the 12th June, and was then estimated to yield:—

Oats—3 tons 7½ cwts.
Barley—18½ cwts.

After being fed off, the oats came away first and yielded more feed than the barley.

J. Hodgson, Group 41.

Soil: Gravelly loam carrying in its virgin state karri and sheoak.

Cleared in 1926 and laid down with pasture which proved a failure.

Ploughed in early March and then cultivated and harrowed.

Seeded: 25th March, 1929.

Rate of Seeding: 1½ bushels oats, 1½ bushels barley per acre.

Fertiliser: 2 cwts superphosphate per acre.

The oats made quicker and more growth than the barley, and were of a better colour.

The crop was fed off in early June and estimated to yield:—

Oats—2 tons 3 cwts.

Barley—1 ton 16 cwts.

As in the former experiment, after feeding off, the oats gave quicker and better returns than the barley.

The average results of the two trials are as follows:—

	Yield of Green Fodder before closing for hay.		Percentage Yields.
	tons.	cwts.	
Oats	2	15¼	100
Barley	1	17¼	67

MINISTER'S VISIT TO MERREDIN EXPERIMENT FARM.

Visit to the Merredin Experiment Farm on 10th May, 1930, of the Hon. P. D. Ferguson, Minister for Agriculture, Professor Prescott and party. Reading from left to right—Dr. L. J. H. Teakle, Plant Nutrition Officer;

Minister at Merredin Experiment Farm.

Hon. P. D. Ferguson, Minister for Agriculture; Mr. Geo. L. Sutton, Director of Agriculture: Professor J. A. Prescott, Chief of the Division of Soil Research in the Waite Agricultural Research Institute, Adelaide; Messrs. J. H. Langfield, Manager of the Merredin Experiment Farm, and I. Thomas, Superintendent of Wheat Farms.

BUNT RESISTANCE TESTS, 1929.

E. J. LIMBOURN, Cereal Breeder, Experiment Farm, Merredin.

The experiment dealing with the resistance or susceptibility of wheat varieties to the disease known generally as "Bunt" or "Smut" (*Tilletia levis*) was again carried out during the past season on the same lines as the tests described in the March (1929) issue of this Journal.

The varieties tested this year were those which, in previous tests, had shown a high—75 per cent.—resistance to the disease; new ones and new strains of old ones.

For instance, "Canimbla" (p. 1729), gave an infection of 56 per cent. when tested in 1927, but a slightly improved strain (p. 1821) was received during 1928, and it was necessary to obtain information as to its resistance to disease. It will be seen that there is no improvement as regards its resistance to Bunt.

The method of infection and conditions of planting as then explained were again adopted with the exception that the variety "Gluyas Early" was used as the control instead of the variety "Booran."

The following is a list of the varieties tested, with the percentage of infection found. The variation in the relation between the number of infected plants and the percentage of infection is due to the fact that the percentage is computed from the actual number of mature plants. One hundred grains are planted of each variety, but the loss of plants during growth varies considerably.

VARIETAL RESISTANCE AS SHOWN BY INFECTION PER ROW.

1929.

Variety.	Reg. No.	Infected plants per row.	Percentage infection per row.
			%
Gluyas Early	P 159	19	20
(Akakomuga x Bald Early)	P 1847	40	44
(Bald Medeah x Bobs)	P 1943	19	25
(Comeback x Minister)	P 1842	22	31
(Federation x Bald Medeah)	P 1838	26	33
(Federation x Bunyip)	C 70	6	7
Gluyas Early	P 159	21	25
Gluyas Early	P 159	17	18
(Florence x Nabawa)...	C 81	1	1
(Gallipoli x Federation)	P 1939	11	22

VARIETAL RESISTANCE AS SHOWN BY INFECTION PER ROW—*continued.*

1929.

Variety.	Reg. No.	Infected plants per row.	Percentage infection per row.
(Gallipoli x Federation)	P 1940	5	14
(Hard Federation x Yellow Marquis) ...	P 1937	34	50
(Nabawa x Carrabin)	C 96	4	5
Gluyas Early	P 159	11	13
Gluyas Early	P 159	27	31
Bindu	P 1887	17	21
Canimbla	P 1821	55	66
Carwarp	P 1835	24	29
Cedar	P 222	2	3
Coral	P 1891	8	15
Gluyas Early	P 159	23	30
Gluyas Early	P 159	27	31
Cowhort	P 1938	22	32
Currimp-Seln. from Chapman Exp. Farm	P 1747	40	53
Dookie Delta	P 1744	20	26
Ford	P 915	1	1
For indentification	P 1892	...	...
Gluyas Early	P 159	30	37
Gluyas Early	P 159	23	28
Genoa	P 1511	...	...
Inderet	P 1750	42	49
Kings White	P 1368	35	42
Marshalls No. 3	P 1374	40	54
Minflor (Seln.)	P 1753	1	1
Gluyas Early	P 159	17	23
Gluyas Early	P 159	31	64
Perfection	P 1929	32	50
Piastre	P 1460	...	...
Stewart	P 1831	43	58
Suvla	P 1699	23	32
Whillan	P 1841	43	64
Gluyas Early	P 159	24	28

"Genoa" (p. 1511) has again proved immune, this being the sixth year in succession that it has been entirely free from infection. It is a very late maturing variety, and for that reason cannot be recommended for growing commercially.

BEE HIVES.

H. WILLOUGHBY LANCE,
Apiculturist.

At this season of the year, when outside work in the Apiary is practically at a standstill, the subject of hives is a suitable one.

All practical bee-keepers should, during the winter months, overhaul all spare hives and parts thereof, and, if expecting to increase, prepare new ones. We presume that all spare combs in good condition have been safely stored, either on the hives or in some suitable place to keep them free from moth; if any have been put away in cupboards or rooms it would be well to examine them at intervals to see that they are free of moth.

All frames with damaged or old combs should have had the combs cut out and melted down. These frames will need overhauling, repairing and tightening, then they may be wired ready for the foundation, which in nine cases out of 10, should be full sheets.

Now, as regards hives, it is surprising what a number of old box hives and badly kept frame hives with cross comb, making it impossible to examine the brood chamber, one finds in some districts. I would here like to remind bee-keepers that such methods of keeping bees is contrary to regulations and anyone found with hives which cannot be easily and efficiently examined is liable to a fine

Some bee-keepers have many odd size hives, very often due to purchasing stocks of bees from different persons. It would be wise for all such to decide which hive suits their method of working and the district best, then make this their standard and gradually eliminate all others. Nothing is more annoying than to find, when a hive requires a spare super, that one has every other pattern except that required.

Generally speaking, there are two types of hives, single wall and double wall.

The single wall type is that mostly in use in this country, principally for two reasons—it being cheaper, and, where hives are moved about to catch the honey flow, it is much more easy to transport.

The double wall type is used very largely in England and some parts of America. It is practically one hive inside a larger one, but both standing on the same floor board. Both the inside box and the outer cover are usually made of half-inch wood. A quilt or wood ceiling is laid on top of the frames and there is a space of several inches between this and the roof, which allows an air space all round and on top of the hive proper. In cold climates this space is packed with paper or other material to conserve the heat. In summer the circulation of air keeps the hive cool. Where an apiarist does not move his hives from one district to another, this is an excellent hive for our hot climate. I have made several of these and never find the bees hanging out in hot weather as with single wall hives. I also consider that I get more honey from these hives, although I have never made an actual test of same.

Figure (1) shows a "W B C" double wall hive with gable roof. Figure (2) shows section of similar hive with sloping roof.

Fig. 1.

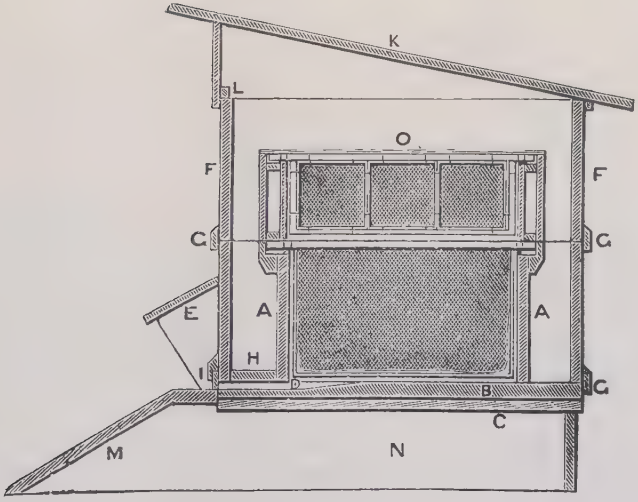


Fig. 2.

The type of single wall hive in most general use in Australia and America is the Langstroth pattern, which has practically become the standard. This hive has frames 17 5/8 inches long by 9 1/8 inches high for the brood chamber. Factory-made hives of this pattern are made of selected timber 7/8 inch thick, the overall dimensions being 20 inches by 16 inches.

Some bee-keepers make their own hives after the Langstroth pattern from petrol cases, but in very many cases these are not satisfactory, either

from lack of knowledge of the requirements of a hive, or from indifferent workmanship. The half-inch wood of petrol cases is not sufficient; two thicknesses should be used. A strip of wood nailed on the inside of the ends instead of rabbeting, is not satisfactory, as it leaves space for the building of comb. All joints, especially those of hives made from petrol cases, should be painted before being nailed together.

Home-made Hives—

For the benefit of those who wish to make their own hives the following particulars are given:—

The standard sizes of factory hives are 8 and 10-frame. The petrol case will make a good 9-frame hive.

The inside width of an 8-fame hive is 12⅛ inches; that of a 10-frame 14¼. A petrol case will make a hive 13¾. Standard frames are 1⅜ inches wide; 10 of these would equal 13¾ inches and be a tight fit, and be very

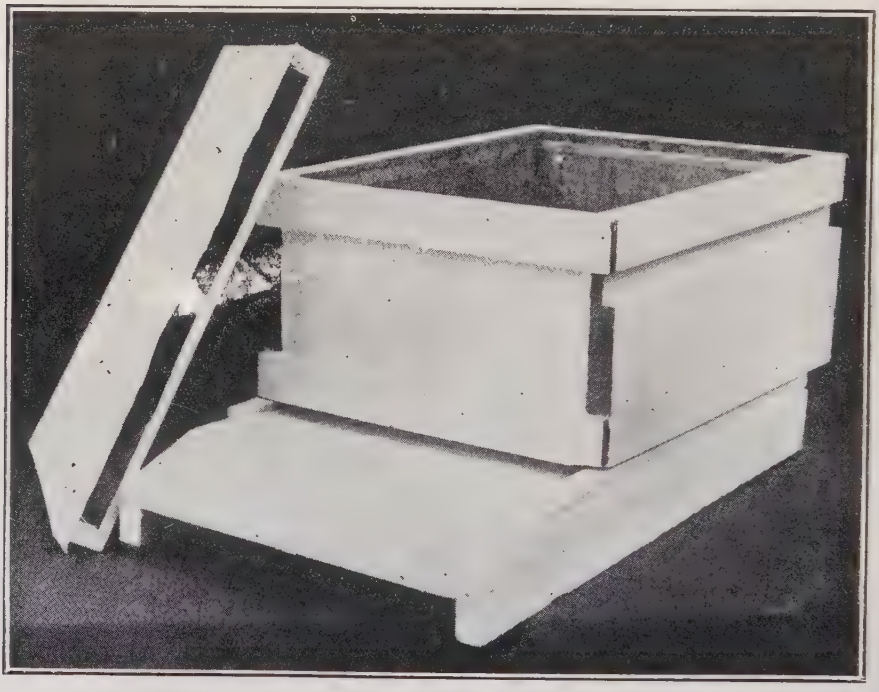


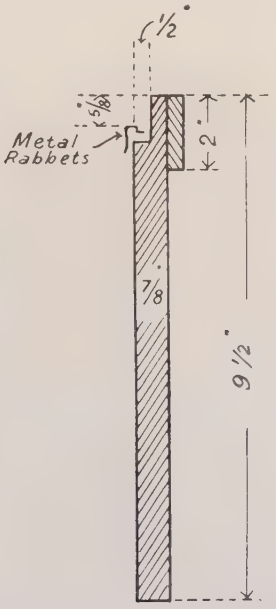
Fig. 3.

difficult to manipulate. These hives, therefore, should only be used for 9 frames. In the supers these frames can be spaced out equally and should produce good fat combs easy to uncap, but in the brood chamber they should be placed close together and a dummy board, say of ⅞ inch wood, inserted to take up the extra space. The reason for this is that the natural spacing of brood combs is 1⅜ inches. Drone brood requires a larger space, and if combs are further apart, the bees have greater facilities and inducements to build drone comb.

Figure 3 is a photograph of the complete hive shown with the body drawn back a little and the roof at the side. The floor is made of the sides of a

petrol case half-inch thick, but if thicker wood is obtainable, so much the better. These are cut 15¾ inches long, nailed to two pieces of 3 x 1 jarrah, and sloped off at front to allow of a good alighting board for the bees. The length of the level portion should be at least 23 inches. On this surface, along the back of the two slides, nail strips of wood 1in. x ⅜in. for the body to rest on. This will raise it above the floor and allow an entrance all along the front.

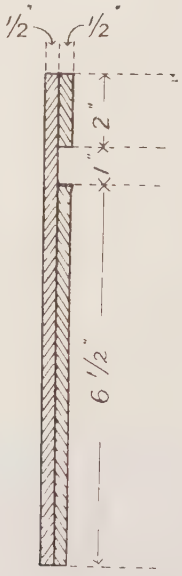
For the body, use the two ends of the case, the top edge being rabbeted, as shown in Figure 4 and metal rabbets nailed on. These can be obtained from any dealer in bee goods. The object of the rabbets being to allow of bees running under the ends of the frames, and also giving less surface for the bees to stick tight with propolis.



Section through AB

Fig. 4.

The sides of the cases are next cut 20⅛ inches long and nailed on to the two ends. The ends are now ⅞ inch thick and the sides half-inch: half-inch, however, is thin for the sides and does not conserve the heat of the hive as well as ⅞ inch; therefore, nail another thickness of half-inch wood outside this, but not the whole depth of side. The top strip may be two inches wide. Then leave a 1 inch gap; the bottom strip will then be 6½ inches wide. Now nail along the top and bottom of front and back two more 2-inch strips. These will strengthen the joints and the strips along the top will give a good hold all round for lifting the body. To make the method of putting the hive together more plain, the ends of the wood in Figure 3 are shown dark. Figure 4 shows a section through the ends, and Figure 5 through the sides. Figure 6 is a plan. The inside measurements of this hive are 9½in. high x 18⅜in. x 13¾in.



Section through C D

Fig. 5.

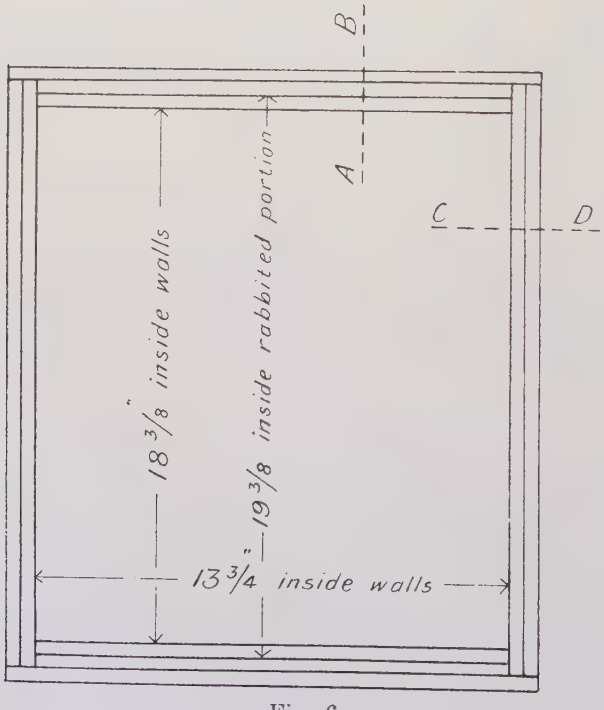


Fig. 6.

The roof can be made of half-inch wood from petrol cases, or if available, thicker wood for preference. The side of a petrol case is the exact length required. Now prepare three strips of 1-inch seasoned jarrah or good white wood, one inch, one and a-quarter inches, and one and a-half inches wide respectively. These form the cross pieces to which the roof is nailed, the one and a-half inch piece in front and the one inch piece at back, thus giving a slight slope to run the water off.

A piece of galvanised iron, 24½in. x 19in., is now obtained, the corners cut and the front and back bent over and nailed to the cover. The sides are bent at an angle of about 45 degrees, but not nailed. This will allow ventilation between the wood top and the iron roof, and will at the same time prevent the rain driving under. Should spiders make their web in this space, it is an easy matter to bend the sides up and clean out the web with a stick. In Figure 3 the visible side is shown bent up for cleaning.

If galvanised iron is not available, a petrol tin may be used. Cut the ends out; cut the remainder down at two opposite corners, so that you have two pieces each composed of two sides of the tin.

These may now be used for the roof, one overlapping the other; the joint being nailed down along the centre cross-piece. The whole should now be painted with two coats of paint, but if tar is available, it is preferable to dip in or paint the floor board with hot tar. The iron roof may be painted with red oxide if desired.

The projecting alighting board, shown in Figure 3, is not suitable for those who move their bees about to catch the honey flow. Figures 7 and 8 show two types of detachable alighting boards.

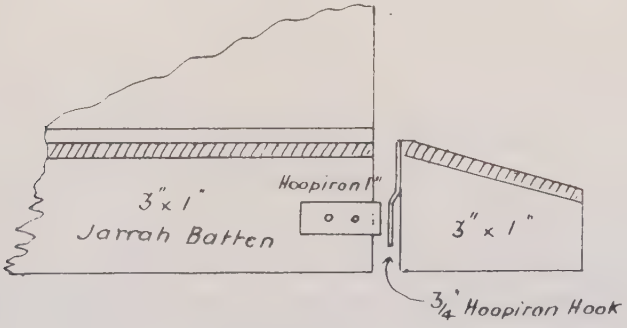


Fig. 7.

In Figure 7 the floor is cut off flush with the front of the hive body and the two clips made of 1 inch hoop-iron, nailed to the front of the 3 x 1 jarrah battens, with the top edge 1½ inches in from the floor. The alighting board has two strips of ½-inch hoop-iron nailed to its battens, being bent slightly so that they will just enter the clips like hooks.

Figure 8 shows the alighting board attached by dowels. Where a number of hives are in use, a jig should be made and the holes bored to the jig so as to make the boards interchangeable. The holes in the alighting board must be made a tight fit, while those in the floor are a loose fit. The dowels should be painted to prevent the absorption of water and the swelling of the wood, which might cause too tight a fit. I have both types in use and prefer the dowel type.

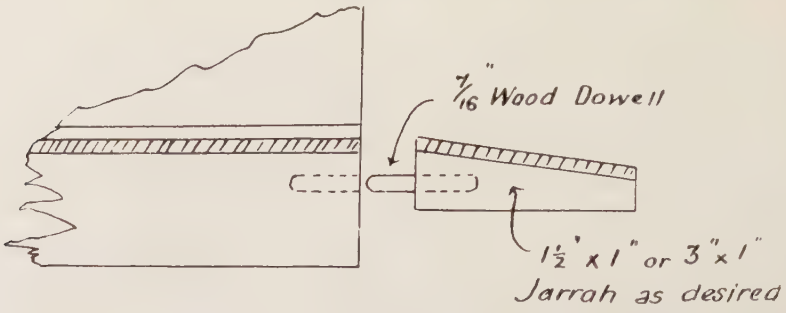


Fig. 8.

Factory Made Hives—

Figure 9 shows a 10-frame factory-made hive of Langstroth pattern with flat cover. Note the dove-tailing of the corners, which makes a thoroughly strong job. These are supplied in the flat and put together by the bee-keeper. Joints should be painted and nailed at every dove-tail with 2¼ inch cement coated nails. These hives can be obtained in either the 8-frame or 10-frame size.

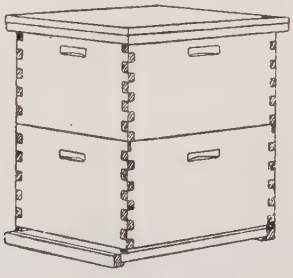


Fig. 9.

In this hive, the tops of the frames are ¼ inch below the top of the body, allowing a bee space over the frames. The bottoms of the frames are flush with the bottom of the body. The bee space and entrance being obtained by ⅜-inch strips on the floor along the sides and back. With this method the bodies can be used either as brood chambers or supers; and is much to be preferred to hives with fixed floors.

Supers for Langstroth hives, whether home made or factory made, may either be full depth 9⅛ inches; half depth, 4½ inches; or ideal, 5¾ inches, according to the requirements of the district or one's personal preference. The drawback with the ideal size is that ordinary extractors made to take the full depth frame will not take two ideals, whereas it will take two half-depth frames.

A few bee-keepers prefer the Bolton hive. This hive has frames the same length as the Langstroth, but 5⅜ inches deep, that is the same size as for supers. The hive was designed by Mr. Bolton for a special system which cannot be gone into here. Brood chambers and supers are all the same size, and the bodies are fitted with thumb-screws at the sides to tighten the

frames together, thus allowing the bodies to be reversed. It can, however, be used as an ordinary hive without working on the Bolton system by using one, two or three bodies for brood as may be required.

Bottom Boards—

With factory-made hives, these are always separate from the body and I strongly recommend that they should always be kept so, as it is necessary that they should be kept clean. At periods when there is a dearth of nectar, the bees uncap their sealed stores for food and the cappings fall to the floor. This is specially noticeable at the close of winter and the refuse is a fine breeding place for moth grubs. A sprightly moth may dodge the entrance guards and just have time to deposit a few eggs in the refuse before the inhabitants are aware of her presence. If the refuse is thick or the frames too close to the floor, the bees cannot get at the grubs to destroy them and it may be the beginning of the end of the colony.

Manufacturers usually supply bottom boards about 7/8 inches thick, but they only project a short distance in front of the hive and many bees coming home heavily loaded, especially in windy weather, miss this narrow alighting board and fall to the ground; then if there are meat ants about, it is good-bye to the Mistress Bee, but even if there are no ants, the bee will require a considerable rest before making another attempt to reach her front door. I consider that the alighting board should be about 6 inches wide and sloped to run the rain off.

To those who have factory-made floors, I recommend that they should cut these off flush with the front of the hive body, nail them to two strips of 3in. x 1in. jarrah and fit a detachable alighting board, as shown in Figure 7 or Figure 8.

Covers or Roofs—

Many types of covers are in use by bee-keepers. Some use flat, thick wood covers, but these do not weather well and they do not run off the rain.

The Beuhne cover is made of thin wood, covered with a sheet metal roof, packed with newspapers between the wood and metal.

The Ventilated Gable Cover has a wood ceiling and a wooden gable roof, with an air space between the two. One drawback about this cover is that it is a harbour for spiders, which on account of its gable design are difficult to dislodge, also the roof being of wood is liable, unless painted frequently, to weather badly and crack.

A cheap and efficient cover is that illustrated in Figure 3 and is very easy to make. The important thing is to get dried and seasoned wood, so that it does not shrink and allow an entrance for robbers at the joints.

The use of quilts is not recommended, as these rest on the top of the frames and prevent the bees from passing over them. The bees, therefore, stick them to the frames with profolis. Quilts are a harbour for moth grubs, as the bees, however strong, cannot get at them. I am a strong believer in a bee space of 1/4 inch to 3/8 inch between the tops of frames and the ceiling.

I occasionally find old-fashioned hives with the gable type of roof and no ceiling or quilt. The great drawback of this type is that there is a space of several inches between the tops of frames and the roof, which the bees frequently fill with comb and honey. When the bee-keeper lifts the cover the comb is broken and there is a lovely mess of honey running down into the hive and drowning hundreds of bees. The difficulty with these covers

can be overcome by making a loose ceiling to rest on the top of the hive; the roof can be placed on this and the air space between the ceiling and roof will keep the hive cool.

When possible it is always best to place hives on stands. In winter the floors keep drier and last longer, and in summer the air can circulate underneath; ants and spiders are not so troublesome and the hives are easier to work as there is not too much stooping.

A good ant-proof stand is shown in Figure 10, and is fully described in the *Agricultural Journal* for September, 1929.

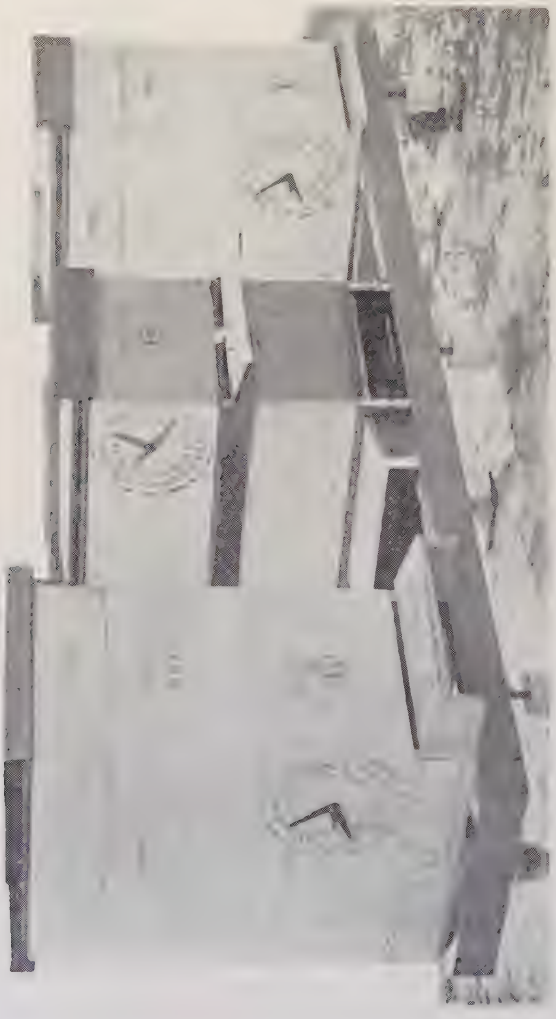


Fig. 10.

If migratory bee-keeping is practised, and it is not possible to use stands, all floors should be fixed to 3 inch x 1 inch jarrah battens, as shown in Figures 3 and 11, to keep the floor off the damp ground. Figure 11 shows a good combination of a factory-made body with home-made floor and cover. It is cheaper and, in my opinion, better than the complete factory made hive.

The dial at the side is a device of my own for recording the condition of the hive at the last examination. The figures show the date and the letters refer to the condition of the hive. A full description of this device was published in the *Agricultural Journal* for September, 1929.

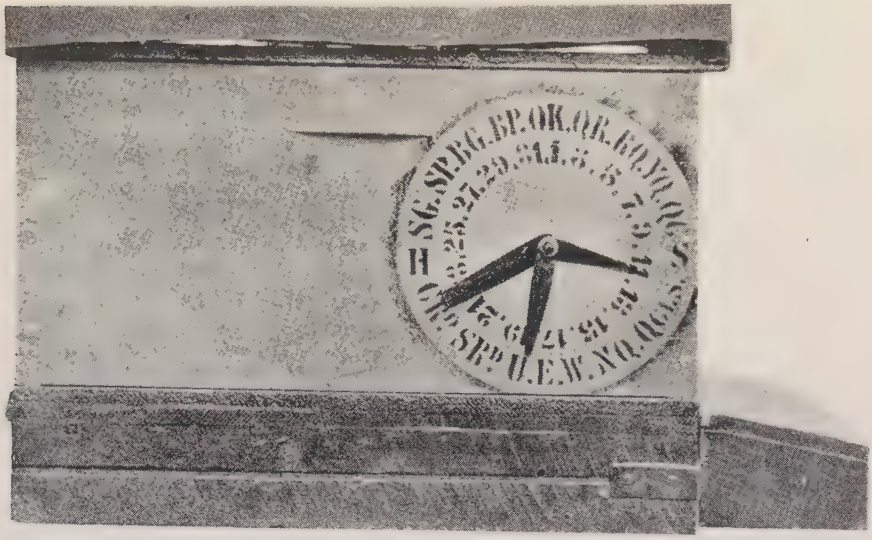


Fig. 11.

Painting—

Paint is a very important part of a hive and much depends on the quality and frequency of painting as to the length of the life of the hive.

All joints should be painted before being put together and nailed, as the joints are usually the first place attacked by the weather. Cement-coated nails should be used whenever possible, as these do not rust and show through the paint like ordinary nails. New hives should have two coats at least of good paint before being used, afterwards one coat every second, third or fourth year, depending upon the quality of the paint used.

As regards the colour, white is that generally used for the whole of the hive, but some bee-keepers that practice migratory bee-keeping and place the hives on the ground, dip the floors in boiling tar or creosote.

There is a tendency at the present time to depart from white and use darker colours. Certainly, a row of clean white hives with a green background, looks very neat and attractive. One rarely in these days sees the roof of a house painted white, for the reason that white absorbs heat and passes it through, whereas red throws off the heat rays. Therefore, the roofs of hives should, whether of wood or iron, be pained with red oxide or some dark colour.

Experiments conducted at the Schleswig Holstein School of Bee-keeping on the drifting of bees from one hive to another, show that bees drift most into hives of the same form and colour as their own, that it is exceptional for them to drift from skeps to frame hives or *vice versa*. It was also

shown that bees prefer hives that are painted yellow, blue or dark colours, or that have their fronts or porches of these colours and that they dislike pale colours and above all, pure white.

Notes made on the numebr of frames occupied by bees at various dates showed that colonies in pale-coloured hives grew weaker, while those in the preferred colour, built up.

I do not say that colour is a very important factor, but the above experiments would go to show that it is a factor, and it is worth while for bee-keepers to try it out. It is quite certain that in a large apiary or in a queen-rearing establishment, it is a great advantage to have hives painted different colours to assist the bees in locating their homes.

TOMATO CULTURE IN WESTERN AUSTRALIA.

E. T. MORGAN,
Vegetable Inspector.

Introduction.

The extensive cultivation of the tomato is of comparatively recent years, but it has advanced so rapidly in public estimation, that large areas are now planted with this wholesome and delicious fruit or vegetable. With our long warm summer, with the mercury sometimes soaring towards 100°, cold lunches with salad are enjoyed by the majority, the tomato takes its true place, as a salad without tomato is like meat without salt.

From available evidence it appears that the tomato originated in Central South America, and it was known and grown by the natives of Mexico, by whom it was highly prized. Apparently it was not used by Europeans as food for upwards of 100 years after its discovery in America, and it was not until about 1870 that it became recognised universally as an important article of diet. It is now regarded by physicians and dieticians as a valuable source of material necessary to good health and proper nutrition. Prices obtained for tomatoes fluctuated considerably, but remunerative returns are generally obtained for a good article, even during glut periods. The grower who puts on the market soiled, grub-eaten tomatoes cannot hope to secure reasonable returns. It is the careful grower who trains his plants, fertilise properly, and effectively combats the attacks of insect pests, thereby producing a good article, who gets a just reward for his labour.

We do have our glut periods, and it is due to the interest and initiative of a well-known Perth firm, which has recently installed machinery for the manufacture of tomato pulp, that steps are being taken to cope with excess production at a certain period of the year.

Prices for early tomatoes are high, and crops harvested in September and October realise anything from £1 to £2 per case. Geraldton and Carnarvon with their early season are first on the market, but quite a large proportion of their crop is exported to the Eastern States, where lucrative prices are obtained.

The production of an early crop is an interesting pursuit as well as a remunerative one, and many growers in the metropolitan area have made large sums of money from relatively small areas. The methods employed are quite simple, but care and attention is necessary to ensure success in this phase of market gardening.

Early Varieties.

Early large red, commonly known as the crinkled variety, is the most suitable for early cropping. Of the smooth varieties Chalk's Early Jewel and Sparke's Earliana are most popular.

Main Crop Varieties.

Chalk's Early Jewel, as well as being a popular early variety, almost takes pride of place as a main cropper. Matchless, Burwood Prize, Ponderosa, Best of All, and Paragon are well-tried and suitable varieties. Dwarf Champion is popular with home gardeners. It is a good bearing variety and does not require staking. The skin is of purplish hue, but unfortunately is inclined to crack. The flavour is excellent.

Selection of Seed.

One of the most important factors in the successful culture of tomatoes is the careful selection of seed. There are many strains of the above varieties, and the careful grower should endeavour to save the seed from his own plantation; also great care should be exercised in its selection. Some time previous to the first picking outstanding plants should be marked. This selection should be made on the basis of vigour, freedom from disease, and the amount and quality of the fruit carried by the plant. The fruit should be well coloured, nice sized, and firm. A good solid tomato is to be preferred to one having soft flesh. Some growers buy fruit from a neighbour, who has grown a good crop, for the purpose of saving seed. This is the next best method to the above-mentioned selection. Obtain seed from a reliable source, and you will have taken the first right step in the production of the tomato crop.

Raising of Plants.

The sowing of seed for the early crop may be carried out from April to July, and some means of protecting them from frosts and heavy rains must be adopted. Some growers prepare the seed bed on the lee side of a building, and place stakes around the bed or curved sticks across it, in order to place hessian covers over the plants at night or during heavy, cold rains. This is risky, and amongst our most successful growers the usual method is to raise the plants under glass. The initial outlay is rather heavy, but over a number of years the cost entailed is justified, owing to the greater surety of raising plants satisfactorily. Artificial heat is generally necessary, and a very successful and economical way of obtaining this is by the use of fresh farmyard manure. Horse manure gives best results; cow manure heats too

slowly, and poultry manure too rapidly. Horse and cow manure mixed together make a good combination; or if horse manure only is obtainable, it should have about one-third to one-half its bulk as straw or fern litter. Mix the whole thoroughly together, watering the heap if necessary, and allow to remain for several days until a good heat has generated. Then take the material and form into a heap 2 to 3 feet high. When the heap has been firmed well down place on it a frame, made as follows:—

Take sufficient light timber to make a box frame about 8 feet long by 5 feet wide, or in that proportion. Make the back of the frame about 2 feet 6 inches high and the front, which should be placed facing the sun, about 18 inches. The glass sashes should be placed on top, a beading being put round the edge of the frame in order to hold the glass in place. If glass is unobtainable, hessian may be used as a covering, but this should be fastened to a roller in order to facilitate the raising and lowering of the cover. The compost heap should be made about 12 inches wider than the frame all round. Seed boxes should then be placed inside the frame. Flat fruit cases are used by the majority of growers and answer the purpose admirably. It is always advisable to obtain unused cases, as if tomatoes have been packed in cases obtained second-hand, there is always danger in using these, owing to the likelihood of disease being carried in them, notably Fusarium Wilt. Soil mixed with stable manure should be used, as it is not advisable to use too much artificial manure with soil intended for seed boxes. Smooth the surface and sow the seeds fairly thickly and cover with a shallow dressing of light soil, sand preferred, and well water, using a fine rose on the watering can, or a fine-nozzled spray pump. As soon as the seeds germinate the sashes should be raised to allow of ventilation. Every living thing must have access to fresh air, and every form of life gives off gases which, if allowed to accumulate, will eventually cause death. Briefly, the hot bed should be ventilated every day. The heat of the bed should never be allowed to become excessive, and should not exceed about 70°. Raising the sashes will cool the bed, and this can be accomplished by placing blocks of wood under the sashes or drawing them back to allow of the circulation of air through the frame. When the plants in the seed box are about 2 inches high, they should be pricked out and transplanted into other seed boxes in the frame and spaced 2 to 3 inches each way. This allows of their making sturdy plants and helps to check "damping off," a disease generally associated with overcrowding in the seed bed. It is also advisable to spray the young plants with a weak Bordeau Mixture, using the formula of 4.4.100, *i.e.*, 4 lbs. of Bluestone, 4 lbs. of lime, and 100 gallons of water. Commercially-prepared forms which are obtainable obviate much time and trouble in this direction. This will tend to check fungal diseases, and the copper solution has a beneficial action on the growth of the plants.

When the plants have attained the height of about 6 inches they will be ready for transplanting. In order to prepare them to withstand the shock of being moved from the artificial conditions of the hot bed to the more rigorous environment of the open air, the plants should be hardened for a week or more before moving. This is done by gradually lowering the application of water: but sufficient water must be allowed to keep the plants alive and strong. The ideal method of hardening plants is to have a structure similar to the hot-bed frame, which is placed directly on to the ground, provided that the land is sufficiently well drained to allow of the free escape of excess water. The plants in the seed boxes should be placed in this, and can be gradually hardened, more effectively than by any other method.

Raising of Plants for the Main Crop.

The seed for the main crop may be planted in the open when danger of frost is over, generally about September and October. The soil is gradually warming up at this period, and if a fairly sheltered spot is picked no difficulty will be experienced in the raising of plants. In some localities slight frosts are experienced during the above months, hence the necessity, in these parts, of choosing a sheltered postition. If, by any chance, plants in the bed suffer from the effects of frost, watering with cold water before the sun's rays strike them will generally save them, as this allows of the gradual thawing of the ice particles and enables the cell-sap to be re-absorbed by the plants. It is the quick thawing of the ice particles that causes the death of the plants, owing to their being unable to re-absorb the sap which has been drawn away from the plant cells by the process of freezing.

The soil of the seed beds should be worked into a fine tilth and about 3 feet wide, leaving a narrow path between to allow of watering and cultivation. The seeds should not be sown too thickly; there should be from 1 to 2 inches between plants. This width enables them to become desirable and stocky plants. The beds should be kept free from weeds and watered sufficiently to keep up a good growth. If at any time the plants are not thriving, watering with a solution of sulphate of ammonia (a large handful to four gallons of water) will encourage growth; but care should be taken not to apply this stimulant directly on to the foliage.

Seed beds are generally made on old cultivated land, and it is a wise plan to fumigate them in order to make sure that certain diseases are not lying in wait for the young plants. Fumigation is carried out quite simply on a small area, and is resorted to by many of our most successful growers.

The method usually adopted is as follows: Using a formalin solution (1 part of formalin to 50 parts of water), the ground should be saturated at the rate of half a gallon per square foot and covered with bags for one or two days. The bags are then removed, the ground is re-dug and left open for two days to allow the fumes to escape. The land is then levelled off and the seeds planted about half an inch deep in rows about 6 inches apart.

(*To be continued.*)

DISTRICT CHALLENGE SHIELD WHEAT YIELD COMPETITION.

I. THOMAS,
Superintendent of Wheat Farms.

This competition, extending over a period of three years, is not for individual farmers, but for a team of five persons representing the district in which they are located. The award is made upon the best average wheat yield obtained over the total area harvested for grain on the farms of the five competitors. The gross yield is determined by the actual quantity of wheat sold, plus the amount retained for seed, and other purposes, and the average calculated from the acreages, which, in all cases, are measured by the officers of the Wheat Branch, who acted as judges.

In this competition the trophies have been presented by the Cuming Smith Farmers' Fertiliser Co., Ltd., and the Mt. Lyell Farmers' Fertiliser Co., Ltd. The first and main trophy is a challenge shield which is valued at 20 guineas. On the completion of the competition this shield will become the property of the district, Society, or Association nominating the winning team of five farmers. On the shield will be recorded permanently the name of the winning Society and the names of the farmers comprising the team. In addition, the names of the districts who win it in any particular year, together with the names of the individuals comprising the team from that district for that year, will be shown. In addition to this shield, the Fertiliser Companies are presenting the members of the winning team with a small replica of the shield, on which will be inscribed the name of the district winning the yearly competition, and each member of the team.

For the first year of the competition (1928-29) seventeen teams fully complied with the conditions of the competition. This year (1929-30) only twelve of these complied with the conditions and qualified for inclusion as competitors in the third and final year of the competition.

The total area harvested by the twelve teams (60 farmers) during 1929 was 32,741 acres, which yielded a total of 611,192 bushels, an average acre yield of 18 bushels 34 lb.

The detailed results for the second year of the competition are as follows:—

RESULTS.

District.	Members of Team.	Acreage.	Yield.			
			Gross.		Average per acre.	
			bus.	lbs.	bus.	lbs.
Gnowangerup	McDonald, J.	279	10,233	56	36	41
	Willard & Willard	249	7,551	24	30	20
	Formby & Co., Ltd. ...	227	6,652	24	29	18
	Lohoar, W.	292	8,376	...	28	41
	Mouritz, E. A.	200	5,303	...	26	31
	Team average	1,247	38,116	44	30	34
Borden	Booroondara Grazing Co., Ltd.	216	6,000	12	27	46
	Moir, C. C.	220	5,776	28	26	15
	Stone, J. D.	584	15,217	8	26	3
	Murray, W. W.	423	10,772	32	25	28
	Stone, S. G.	231	5,177	...	22	25
	Team average	1,674	42,943	8	25	39

RESULTS—*continued.*

District.	Members of Team.	Acreage.	Yield.			
			Gross.		Average per acre.	
			bus.	lbs.	bus.	lbs.
Yandanooka	Eckermann, H. W.	257	7,214	52	28	4
	Saunders, W. S.	241	6,735	8	27	57
	Quartermaine, R.	229	5,616	...	24	31
	Smith, H. A.	545	12,760	4	23	25
	Browning, H.	222	4,862	9	21	54
	Team average	1,494	37,188	13	24	53·5
Three Springs	Bastian, A.	333	8,494	...	25	30
	Carter, R., & Son	277	6,997	...	25	16
	Thomas, C. F., & Son ...	526	11,512	12	21	53
	Cousins, A. H.	700	14,204	...	20	17
	Strutton, A. R.	546	10,216	3	18	43
	Team average	2,382	51,423	15	21	35
Moulyinning	Wilson, A. F.	550	12,678	23	23	3
	Mott, C.	249	5,248	...	21	5
	Mott, H.	222	4,619	...	20	48
	Clark Bros.	315	6,014	54	19	6
	Hornsby & Son	344	6,504	20	18	54
	Team average	1,680	35,064	37	20	52
Bruce Rock	Smith, C., & Sons	2,765	56,972	...	20	36
	Ellis, M. P. & E. G. ...	296	5,538	29	18	42
	Garret, G.	697	12,973	28	18	36
	Cusbert, L. C.	559	9,294	44	16	38
	Muntz, J. N., & Sons ...	379	5,839	36	15	24
	Team average	4,696	90,618	17	19	18
Tammin	Nottage, R. B.	249	6,029	...	24	13
	Hocking, H. R.	392	8,041	25	20	31
	Mackin, C.	558	10,454	...	18	44
	Uppill, G.	902	16,157	25	17	55
	Mann, J. W.	609	10,755	...	17	40
	Team average	2,710	51,436	50	18	59
Kulin	Nichols, R.	751	13,662	10	18	12
	Johnston, H. C.	723	12,938	35	17	54
	Trotter, A. W.	464	8,292	22	17	52
	Henderson, J. H.	483	8,572	47	17	45
	Howe Bros.	318	4,710	54	14	49
	Team average	2,739	48,176	48	17	36
Ogilvie	Laurence, H. N.	502	9,467	18	18	52
	Inzard, A.	927	16,382	49	17	40
	Atkinson, A. G.	597	9,839	39	16	29
	Cripps Bros.	600	9,827	5	16	23
	Horan, A. J.	1,429	22,274	...	15	35
	Team average	4,055	67,790	51	16	43
Corrigin	Jenkins, R. M.	586	10,293	24	17	34
	Crossland, J. L.	990	17,053	31	17	13
	Horsman, H., & Son ...	561	9,159	26	16	20
	Fulwood, C., & Son ...	352	5,480	31	15	34
	Jewell, J. D.	602	9,181	21	15	15
	Team average	3,091	51,168	13	16	33
Kukerin	Gard, T.	320	5,135	12	16	3
	Faulkner, W. J.	372	5,874	29	15	47
	Bahr, E. O.	337	5,312	14	15	46
	English, J. C.	931	13,932	32	14	53
	Sugg, M.	434	6,210	55	14	19
	Team average	2,394	36,465	22	15	14
Nungarin	Johnston, J. H.	575	8,531	8	14	50
	Creagh Bro	1,060	15,697	0	14	49
	Fitzpatrick, R. C.	783	11,200	48	14	18
	Dawe, S. D.	826	11,669	26	14	8
	Reynolds, A. G.	1,335	13,700	54	10	16
	Team average ...	4,579	60.799	16	13	17

The progressive results of the competition are tabulated in detailed form below. These results are for both the 1928-29 season and the 1929-30 season and show the district teams' averages for the two years.

RESULTS.

District.	Members of Team.	Acreage.	Yield. Gross.		Yield. Average per acre.	
			bus.	lbs.	bus.	lbs.
Gnowangerup—1929 ...	McDonald, J.	279	10,233	56	36	41
	Willard & Willard	249	7,551	24	30	20
	Formby & Co., Ltd. ...	227	6,652	24	29	18
	Lohoar, W.	292	8,376	...	28	41
	Mouritz, E. A.	200	5,303	...	26	31
		1,247	38,116	44	30	34
1928 ...	Davis, N. P.	337	9,952	...	29	32
	Parkinson, A. W.	243	7,123	...	29	19
	Garnett, J.	200	5,482	...	27	25
	Johnson, A.	332	8,093	...	24	23
	Chambers, E.	292	6,177	...	21	19
		1,404	36,827	...	26	14
Gross Yield 2 years—74,943 bus. 44lbs. Gross acreage, 2 years—2,651. Average per acre over 2 years—28 bus. 16lbs.						
Yandanooka—1929 ...	Eckermann, H. W.	257	7,214	52	28	4
	Saunders, W. S.	241	6,735	8	27	57
	Quartermaine, R.	229	5,616	...	24	31
	Smith, H. A....	545	12,760	4	23	25
	Browning, H.	222	4,862	9	21	54
		1,494	37,188	13	24	53·5
1928 ...	Neville, P. C.	313	9,900	...	31	38
	Saunders, W. S.	238	6,760	...	28	24
	Eckermann, H. W.	255	6,452	...	25	18
	Duff, T.	302	7,176	...	23	46
	Wick, E. F.	291	6,490	...	22	16
		1,399	36,778	...	26	17
Gross Yield, 2 years—73,966 bus. 13lbs. Gross acreage, 2 years—2,893. Average per acre over 2 years—25 bus. 32lbs.						
Borden—1929	Booroondara Grazing Co., Ltd.	216	6,000	...	27	46
	Moir, C. C.	220	5,776	28	26	15
	Stone, J. D.	584	15,217	8	26	3
	Murray, W. W.	423	10,772	32	25	28
	Stone, S. G.	231	5,377	...	22	25
		1,674	42,743	8	25	39
1928	Milne, M.	257	6,978	...	27	9
	Bungey, R.	332	8,200	...	24	42
	Murray, W.	201	4,900	...	24	23
	McLennan, W., Estate of ...	215	5,220	...	24	17
	Moir, J.	200	4,197	...	20	59
		1,205	29,495	...	24	29
Gross yield, 2 years—72,438 bus. 8lbs. Gross acreage, 2 years—2,879. Average per acre over 2 years—25 bus. 10lbs.						
Three Springs—1929 ...	Bastian, A.	333	8,494	...	25	30
	Carter, R., & Sons	277	6,997	...	25	16
	Thomas, C. F., & Sons ...	526	11,512	12	21	53
	Cousins, A. H.	700	14,204	...	20	17
	Strutton, A. R.	546	10,216	3	18	43
		2,382	51,423	15	21	35
1928 ...	Bastian, A.	283	6,953	...	22	53
	Glyde, K. S.	328	6,806	...	21	4
	Thomas & Sons	567	11,692	...	18	44
	Carter, R., & Sons	353	6,297	...	17	57
	Broad, A. F.	605	9,524	...	16	10
		2,206	41,791	...	18	56
Gross yield, 2 years—93,214 bus. 10lbs. Gross acreage, 2 years—4,588. Average per acre over 2 years—20 bus. 19lbs.						

RESULTS—*continued.*

District.	Members of Team.	Acreage.	Yield. Gross.		Yield. Average. per acre.	
			bus.	lbs.	bus.	lbs.
Moulyinning—1929 ...	Wilson, A. F.	550	12,678	23	23	3
	Mott, C.	249	5,248	...	21	17
	Mott, H.	222	4,619	...	20	48
	Clerk Bros.	315	6,014	54	19	6
	Hornsby & Sons	344	6,504	20	18	54
		1,680	35,064	37	20	52
1928 ...	Wilson, A. F.	415	8,715	...	21	0
	Hornsby & Sons	250	5,134	...	20	32
	Clark Bros.	289	4,767	...	16	30
	Mott, C.	461	7,517	...	16	19
	Elder, A.	429	5,960	...	13	54
		1,844	32,093	...	17	24
Gross yield, 2 years—67,157 bus. 37lbs. Gross acreage, 2 years—3,524. Average per acre over 2 years—19 bus. 3lbs.						
Bruce Rock—1929 ...	Smith, C., & Sons	2,765	56,972	...	20	36
	Ellis, M. P. & E. G. ...	296	5,538	29	18	42
	Garret, G.	697	12,973	28	18	37
	Cusbert, L. C.	559	9,294	44	16	38
	Muntz, J. N., & Son ...	379	5,839	36	15	24
		4,696	90,618	17	19	18
1928 ...	Mann, R.	543	9,620	...	17	43
	Heggarty, H. J.	333	5,724	...	17	11
	Stone, S. B.	540	9,170	...	16	59
	Abraham, J. M.	665	10,165	...	15	17
	Tibbs, J. A.	318	4,821	...	15	10
		2,399	39,500	...	16	28
Gross yield, 2 years—130,118 bus. 17lbs. Gross acreage, 2 years—7,095. Average per acre over 2 years—18 bus. 20lbs.						
Kulin—1929	Nichols, R.	751	13,662	10	18	12
	Johnston, H. C.	723	12,938	35	17	54
	Trotter, A. W.	464	8,292	22	17	52
	Henderson, J. H.	483	8,572	47	17	45
	Howe Bros.	318	4,710	54	14	49
		2,739	48,176	48	17	36
1928	Henderson, J. H.	578	13,182	...	22	48
	Johnson & Murray	404	8,202	...	20	18
	Trotter, A. W.	409	7,003	...	17	7
	Nichols, R.	669	11,148	...	16	40
	Howe Bros.	321	4,923	...	15	20
		2,381	44,456	...	18	40
Gross yield, 2 years—92,632 bus. 48lbs. Gross acreage, 2 years—5,120. Average per acre over 2 years—18 bus. 6lbs.						
Tammin—1929	Nottage, R. B.	249	6,029	...	24	13
	Hocking, H. R.	392	8,041	25	20	31
	Mackin, C. C.	558	10,454	...	18	44
	Uppill, G.	902	16,157	25	17	55
	Mann, J. W.	609	10,755	...	17	40
		2,710	51,436	50	18	59
1928	Uppill, G.	963	16,644	...	17	17
	Mann, J. W.	378	7,306	...	19	19
	Thomson, M.	621	9,994	...	16	6
	Mackin, C. C.	829	11,560	...	13	57
	Hocking, H. R.	385	5,718	...	14	51
		3,176	51,222	...	16	8
Gross yield, 2 years—102,658 bus. 50lbs. Gross acreage, 2 years—5,886. Average per acre over 2 years—17 bus. 27lbs.						

RESULTS—*continued.*

District.	Members of Team.	Acreage.	Yield. Gross.		Yield. Average per acre.	
			bus.	lbs.	bus.	lbs.
Ogilvie—1929	Laurence, H. N.	502	9,467	18	18	52
	Inzard, A.	927	16,382	49	17	40
	Atkinson, A. G.	597	9,839	39	16	29
	Cripps Bros.	600	9,827	5	16	23
	Horan, A. J.	1,429	22,274	...	15	34
		4,055	67,790	51	16	43
1928	Laurence, H. N.	383	8,590	...	22	26
	Atkinson, A. G.	468	9,156	...	19	34
	Hollis & Browne	425	7,458	...	17	33
	Horan, A. J.	969	15,160	...	15	39
	Carson, P.	825	11,889	...	14	25
		3,070	52,253	...	17	1
Gross yield, 2 years—120,043 bus. 51lbs. Gross acreage, 2 years—7,125. Average yield per acre over 2 years—16 bus. 51 lbs.						
Corrigin—1929	Jenkins, R. M.	586	10,293	24	17	34
	Crossland, J. L.	990	17,053	31	17	13
	Horsman, H., & Sons ...	561	9,159	26	16	20
	Fulwood, C.	352	5,480	31	15	34
	Jewell, J. D.	602	9,181	21	15	15
		3,091	51,168	13	16	33
1928	Sainsbury, C. W.	274	4,920	...	17	57
	Crossland, J. L.	791	13,899	...	17	34
	Bremmer, J. R., & Sons ...	1,124	16,839	...	14	59
	Cronin, J.	671	9,585	...	14	17
	Overheu, W. P.	651	9,302	...	14	17
		3,511	54,545	...	15	32
Gross yield, 2 years—105,713 bus. 13lbs. Gross acreage, 2 years—6,602. Average per acre over 2 years—16 bus. 1lb.						
Nungarin—1929	Johnston, J. H.	575	8,531	8	14	50
	Creagh Bros.	1,060	15,697	0	14	49
	Fitzpatrick, R. C.	783	11,200	48	14	18
	Dawe, S. D.	826	11,669	26	14	8
	Reynolds, A. G.	1,335	13,700	54	10	16
		4,579	60,799	16	13	17
1928	Williams, F. A.	483	8,042	...	16	39
	Dawe, A. F. (estate of late) ...	290	4,738	...	16	20
	Creagh Bros.	916	14,141	...	15	26
	Warner, F. L.	627	8,741	...	13	57
	Payne, H. G.	518	6,113	...	11	48
		2,834	41,775	...	14	44
Gross Yield, 2 years—102,574 bushels 16 lbs. Gross Acreage, 2 years—7,413. Average over 2 years—13 bushels 50 lbs.						
Kukerin—1929	Gard, T.	320	5,135	12	16	3
	Faulkner, W. J.	372	5,874	29	15	47
	Bahr, E. O.	337	5,312	14	15	46
	English, J. C.	931	13,932	32	14	58
	Sugg, M.	434	6,210	55	14	19
		2,394	36,465	22	15	14
1928	Gard, T.	251	3,857	...	15	22
	English, J. C.	808	11,688	...	14	28
	Smith, J.	256	3,221	...	12	35
	Harrison, W.	249	2,991	...	12	1
	Ditchburn, R.	488	5,363	...	10	59
		2,052	27,120	...	13	13
Gross yield, 2 years—63,585 bus. 22lbs. Gross acreage, 2 years—4,446. Average per acre over 2 years—14 bus. 18lbs.						

POTATO CERTIFICATION SCHEME.

Denmark and Young's Siding Districts.

STUD SEED PLOTS RECOMMENDED DURING WINTER MONTHS.

H. A. Pittman, B.Sc. Agric., Plant Pathologist,
and
H. G. Elliott, Dip. Agr., Assistant Plant Pathologist.

While on two separate visits to the potato-growing areas of the Denmark-Young's Siding District, with officers of the Potato Branch, during the early part of this year, the writers were very agreeably struck with the fact that the crops grown from certified seed were, in every instance, very much more vigorous and free from diseases—especially those of a "degeneration" or virus nature—than those grown from non-certified seed in similar soil, with the same treatment, in the same district.

Nevertheless, even the best plots of the very best growers showed a certain amount of virus diseases. To remedy this defect, and still further improve the quality of the certified seed, it is very strongly recommended that growers should establish small stud seed plots in the winter time, for the purpose of raising sufficient healthy seed for the growth of the summer crops.

The main point in doing this is that many of the virus diseases, such as "mild mosaic," "crinkly mosaic," "rugose mosaic," and "leaf roll," which are the main causes of degeneration in type and reduction in yield, are to a large extent masked during the summer time by the hot weather. The result is that many of the plants which appear quite healthy in the swamp crops, may actually be infected with virus diseases during the summer without showing any symptoms. In succeeding crops these symptoms may show up, and the consequence will be an ever-increasing reduction in yield, unless special steps are taken to obviate this happening.

"DEGENERATION" OR "RUNNING-OUT" OF POTATO VARIETIES.

In the past it has been the common experience of potato growers in nearly all parts of the world that potato varieties sooner or later "degenerate" to such an extent that they become unprofitable, and a new variety—usually first obtained as a seedling—is then introduced to take its place. As a very large number of other kinds of plants can be propagated vegetatively from buds, cuttings, tubers, corms, grafts, etc., as the case may be, for an indefinitely long period without showing any degeneration in the quantity or quality of the yield, it has always been somewhat of a puzzle why potato strains should more or less rapidly "run out."

Of recent years the explanation has been supplied by numerous scientists who have discovered that the cause of the "running out" is the introduction and spread of virus diseases by means of such sucking insects

Fig. 1.—Healthy Potato Plant. Notice great vigor of growth, abundance of soft foliage, and entire absence of mottling, wrinkling, or rolling of the leaflets. Compare with Figures 2, 4 and 5.

Photo. after W. M. Carne, this Journal, June, 1927.

as aphids, thrips, leaf hoppers, etc. Virus diseases are caused by extremely small parasites, and they cannot be controlled by spraying methods, as the parasites live in the sap of the plants and are therefore quite unharmed by any spray materials which may be applied to the outside. The only practicable control measures are to start off with healthy plants and *keep* them healthy by continuous selection and a rigorous and unceasing campaign against insect carriers.

Fig. 2.—Potato plant with "crinkly mosaic." Photographed to same scale as Fig. 1. Notice mottling and crinkling of many of the leaflets, especially those near the top of the plant. Such plants give considerably lower yields than healthy plants grown under identical conditions, and they act as centres of infection to the healthy plants round about. The disease is spread by means of infected tubers, aphids, and perhaps also by other kinds of sucking insects. Symptoms of the disease show up very plainly in the winter months, but may be entirely obscured during the summer on account of the high temperatures. All such plants should be removed from the "stud plots" and destroyed.

Photo. after W. M. Carne, this Journal, June, 1927.

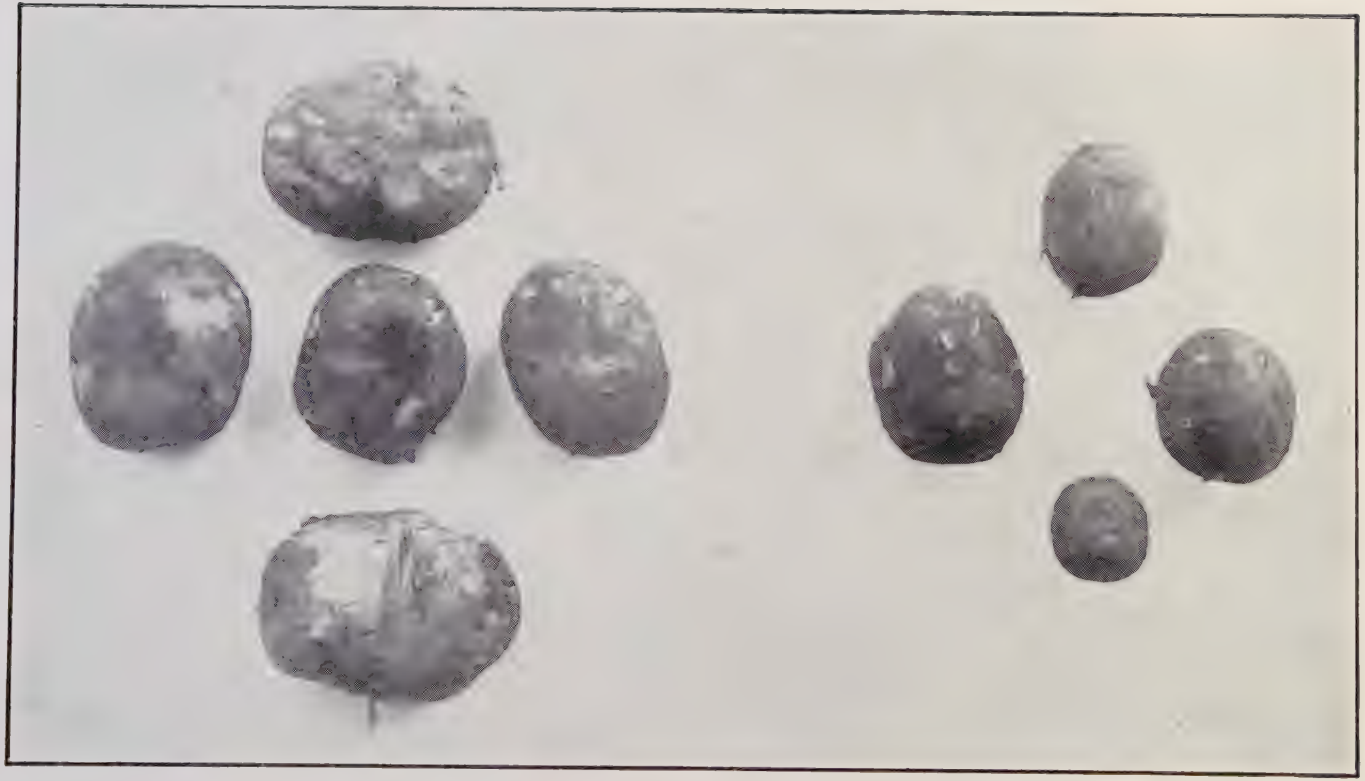


Fig. 3.—A. Potatoes from healthy plant in Fig. 1.

Fig. 3.—B. Potatoes from "crinkly mosaic" plant in Fig. 2.

Photo, after W. M. Carne, this Journal, June, 1927.

PROCEDURE RECOMMENDED FOR ESTABLISHING STUD PLOTS.

Healthy, high-yielding plants can be obtained by selecting apparently-healthy, well-grown plants with a large number of big tubers (not less, say, than ten per plant) from the swamp crop. These should be planted in an

Fig. 4.—Advanced "Leaf Roll" of Potato. Affected plants are usually smaller than healthy ones, and they often have an unusually large number of branches, each, or some of which, bear a number of brittle, thickened, yellowish, sometimes purple-tinted, rolled leaflets. The whole of an affected plant often has a stiff, pale, yellowish appearance, and the rolled leaflets give out a characteristic rattle when the plants are shaken. "Leaf-roll" causes a much more serious reduction in yield than either "mild" or "crinkly mosaic." The disease is carried by aphids or infected tubers. It is not "masked" by high temperatures.

(Photo. N.S.W. Dept. Agric.)

isolated spot during the winter months, and any hills showing mild green and yellowish mottling of the foliage ("mild mosaic"), mottling and crinkling of the foliage ("crinkly mosaic"), very severe mottling, rolling and dwarfing of the foliage ("rugose mosaic"), or brittle, yellowish, rolled leaflets and dwarfing of the plants ("leaf roll"), should be pulled up and destroyed as soon as noticed.

Fig. 5.—Severe form of "rugose mosaic" on Bliss Triumph. Any plants showing such symptoms should be immediately destroyed.

After the photograph by B. F. Dana, in Heald's "Manual of Plant Diseases."

Aphids or other sucking insects should be prevented from spreading the virus diseases within the stud plot, or to the stud plot from the main winter crop, by the use of sulphur and nicotine dust, or "black leaf 40" or other suitable contact sprays. As a matter of fact, aphids and other sucking insects are usually at a minimum during the winter months owing to the low temperatures and high humidity. This fact, combined with the certainty of any virus diseases present in the tubers showing up during the cool winter weather, gives a great opportunity to the growers to very largely eliminate

virus diseases from their stud plots, assuming, of course, that the seed for the stud plot is obtained from the best possible strain of certified seed in the first place.

The stud plot should be very well fertilised, well drained and well cultivated, so that as large a tonnage of seed as possible may be obtained for the subsequent swamp crop from a relatively small, and easily looked after, "stud plot."

Although, theoretically, it would be the best possible plan to save a small amount of the very best seed from the one winter stud plot to establish the winter stud plot of the following year, in practice this is hardly feasible, owing to the great amount of shrivelling and excessively long shoots which normally develop in "Delawares" when stored for such long periods. It would therefore seem advisable to establish a small stud plot at the same time as each of the main crops, irrespective of seasonal considerations, but bearing always in mind that it is only during the cooler months of the year that absolutely effective elimination of "virus-affected" plants can be carried out. For example, the first stud plot planted in March could be dug in July. This would give sprouted seed for planting in the swamps in November and December. This in turn would provide seed for planting in the hills or high land in June or July of the following year. This would provide seed for planting again in December, and so on in like manner indefinitely. (A point that should be borne in mind is that when planting sprouted seed any tubers showing long spindly shoots should be destroyed, as this condition is frequently an indication of "leaf roll.")

In putting forward the above brief suggestions for the establishment of potato stud plots it is realised that the idea is not at all new, as the principle has been advocated from some years now by the officers of the Potato Branch under the leadership of Mr. G. N. Lowe, Senior Potato Inspector, but it is felt that if the growers of the districts mentioned and the neighbouring districts of Elleker and Torbay, etc., adopt the recommendations made above, a considerable further improvement will be made in the already high standard of the certified seed of those districts, which, owing to the good soils of the swamps, relatively high summer rainfall, comparative freedom from insect pests able to spread virus diseases, and the accumulated experience of the certified potato growers as a whole, are rendered eminently suitable to become, for all time, the potato seed nurseries of the State.

PHOSPHATIC LICKS FOR STOCK.

A TRIAL WITH BASIC SUPERPHOSPHATE.

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When investigating methods for remedying Phosphorus Deficiency in stock in South Africa, Sir Arnold Theiler and his colleagues found that precipitated calcium phosphate behaved very like bonemeal.* This information seemed likely to be of considerable economic importance to the stock owners of Western Australia, for precipitated calcium phosphate can be readily prepared by mixing, say, 1 part of lime with 5 parts of superphosphate or purchased already prepared as basic superphosphate under the trade name of "Basic Phosphate," at a very much lower cost than can sterilised bonemeal. The relative costs being approximately £6 and £20 per ton.

Basic superphosphate (Basic Phosphate), however, in addition to containing precipitated phosphate, contains about 50 per cent. of gypsum—calcium sulphate—a product resulting necessarily from the reaction following the mixture of lime and superphosphate. No information was available as to the effect of this gypsum would have on the animal when ingested as a lick, it might be quite inert or it might be harmful. To obtain information on this point, it was decided to carry out the experiment now being recorded, its object being to determine:

"The harmful effect, if any, of the gypsum in Basic Superphosphate when fed to sheep."

It was decided to conduct the trial at the Avondale State Farm because of its location in the centre of an important sheep raising district, and because of the facilities available. For this trial the commercial basic superphosphate, which contains a registered amount of 17 per cent. phosphoric acid, mainly in the di-calcic form, was used to supply the precipitated calcium phosphate.

The Basic Superphosphate used was the ordinary fertiliser, and not specially prepared for "lick" purposes. In the latter case the lime used for mixing with the superphosphate would contain fewer impurities, mainly sand, than that used for making the fertiliser. The ground limestone used for making fertiliser is about 80 per cent., so that the basic superphosphate fertiliser used in this case as a lick would contain about 4 per cent. sand.

It was calculated that a sufficient weekly ration for a sheep of about 80 lb. live weight, would be supplied by about 2 ozs. of this basic superphosphate; arrangements were made, therefore, to give this to one group of sheep as a weekly dose, and to mix it with half its weight—1 oz.—of stock salt, as the latter would invariably be mixed with the former when used as a "stock lick." Another group of sheep grazing on the same feed, but without any lick to provide a mineral supplement in any form, was used

* Phosphorus deficiency in the Livestock Industry. Page 38 Thieler, Green and Du Toit, 1924.

as a control with which to compare the effect of feeding this mineral phosphatic lick containing gypsum. For comparative purposes, groups of sheep receiving respectively a weekly ration as under—

(1) Bonemeal 2ozs.; Stock Salt 1oz, and
(2) Stock Salt 1oz.

were also included. Each group consisted of 25 sheep. To secure the necessary number for the four groups, 100 wethers of average size and condition were run off in February, 1929, from a line of North-West store wethers, which had been purchased at Midland Junction saleyards in the previous December for the purpose of being fattened. The sheep were then selected according to age, so that each group consisted of—

6-tooth sheep	...	...	15
Full-mouthed sheep	...		10

The groups were designated A. B. C and D, as under—

A. Group, numbered 1 to 25—Nos. 1 to 10 being full-mouth, Nos. 11 to 25 being 6-tooth.
B. Group, numbered 26 to 50—Nos. 26 to 35 being full-mouth, Nos. 36 to 50 being 6-tooth.
C. Group, numbered 51 to 75—Nos. 51 to 60 being full-mouth, Nos. 61 to 75 being 6-tooth.
D. Group, numbered 76 to 100—Nos. 76 to 85 being full-mouth, Nos. 86 to 100 being 6-tooth.

The treatment decided upon for each group was as follows:—

Group A.—to receive no mineral ration.
Group B.— " " 1oz. Salt weekly.
Group C. " " 2ozs, Bonemeal and 1oz. Salt weekly, and
Group D.— " " 2ozs. Basic Superphosphate and 1oz. Salt weekly.

It was arranged to administer the weekly ration in three equal doses during the week. To enable this to be done, the sheep were yarded on alternate days, excluding Sundays, and in order to ensure that the individual sheep should receive the full amount allotted to it, those receiving a mineral ration were placed in a drafting race, and the allotted 1/3rd. of the weekly ration was poured down their throats through the inverted neck of a bottle.

As the sheep were from the North-West and accustomed to roaming over a wide range under conditions entirely different from those which obtained during the progress of the experiment, and which involved their being yarded thrice weekly, it was considered that their condition might suffer as the result of so much handling. Because of this the control sheep in Group A, receiving no mineral ration, were yarded at the same time as the others. All groups were treated, watered and grazed in an identical manner, except for the difference in the mineral—"lick"—ration and the actual operation of administering it in the case of the control sheep—Group A.

The rainfall during the period of the experiment was as under—

February		...	...	102	points
March	...	...	...	45	,,
April	...	...	...	21	,,
May	...	...	...	284	,,
June	...	...	...	341	,,

For the first six weeks the sheep were pastured on wheaten and oaten stubble; whilst on this feed they were drinking fresh well-water. Later they were pastured on herbage, which had grown on stubble land, and which had been cropped with oats three years previously. The water supply

Administering the specified dose of experimental lick.

in this paddock was brackish and unsuitable for horses or cattle. Samples from three watering places in the same paddock were obtained in February of this year and analysed with the following results:—

Figures represent grains per gallon:—

——	No. 1. Soak on side of gully.	No. 2. Taken from gully.	No. 3. Taken from soak out from gully.
Total soluble salts	26·46	672·84	588·14
Sodium chloride (calc. from chlorine	15·54	653·59	567·70
Calcium, Ca.	2·87	11·06	17·78
Magnesium, Mg.	3·58	48·79	37·31
Reaction, pH.	7·4	8·2	7·6

All three waters contained an unusually high proportion of magnesium.

These results indicate the quality of the water which the experimental sheep were getting, but in connection with them it must be stated that in February, 1929, the rainfall recorded was 102 points, whilst in February, 1930 the rainfall was only five points.

The sheep arrived on the farm in December and mineral feeding commenced on February 11th.

The crate in which the sheep were weighed in accordance with the requirements of the experiment.

The sheep were weighed at the beginning monthly, and at the end of the experiment when they were to be marketed, slaughtered and examined post mortem. The first weighing was made on February 11th, 1929, it had been delayed for a few weeks with the object of allowing the sheep to become accustomed to their surroundings to afford them a chance to recover from the effects of travelling from the North-West. Subsequent weighings were made as follows:—

2nd weighing on March 11th.
3rd weighing on April 8th
4th weighing on May 6th
5th weighing on June 4th

During the progress of the experiment several of the sheep became affected with "Pink Eye," these were removed from the experiment and the previous weighings of these sheep were not included in the average comparisons. The number of sheep in each group was, thus, reduced to Group A, 23 sheep; Group B, 20 sheep; Group C, 19 sheep, and Group D, 21 sheep. The details of the weighings are set out in the following table—

AVONDALE FARM SHEEP FEEDING EXPERIMENT.

Group A. No mineral ration.						Group B. 1oz. salt weekly.					
Sheep No.	Monthly weighings.					Sheep No.	Monthly weighings.				
	1st.	2nd.	3rd.	4th.	5th.		1st.	2nd.	3rd.	4th,	5th.
1 ...	77	76	82	79	82	26 ...	84	79	86	86	94
2 ...	75	76	80	82	82	27 ...	81	76	81	87	81
3 ...	79	79	84	80	82	28 ...	77	74	79	87	82
4 ...	75	69	76	74	78	29 ...	80	72	78	87	79
5 ...	84	81	85	84	87	30 ...	67	68	75	74	74
6 ...	93	85	93	92	91	31 ...	78	84	88	90	94
7 ...	82	78	84	83	85	32 ...	76	82	84	84	87
8 ...	74	72	79	78	82	33 ...	76	76	79	81	84
9 ...	91	85	93	92	96	34 ...	80	76	82	82	87
10 ...	70	75	84	85	85	35 ...	79	80	86	89	86
11 ...	76	71	78	74	79	36 ...	79	76	85	83	90
12 ...	85	82	89	86	93	37 ...	83	77	83	83	84
13 ...	...	...	...	...	...	38 ...	...	...	...	...	...
14 ...	83	76	84	83	87	39 ...	70	71	79	87	83
15 ...	77	81	85	85	86	40 ...	71	75	77	79	84
16 ...	72	73	80	76	80	41 ...	72	71	72	75	76
17 ...	87	77	81	83	82	42 ...	...	...	...	...	...
18 ...	84	85	87	88	92	43 ...	...	...	...	...	...
19 ...	82	80	81	83	89	44 ...	66	66	70	67	74
20 ...	75	70	79	74	76	45 ...	...	...	...	...	...
21 ...	72	71	78	87	79	46 ...	78	76	82	87	82
22 ...	...	...	...	...	...	47 ...	...	...	...	...	...
23 ...	84	78	83	80	79	48 ...	75	68	75	76	81
24 ...	76	73	81	81	80	49 ...	71	71	77	87	86
25 ...	82	73	82	79	85	50 ...	82	81	89	86	92
Totals (23)	1,835	1,766	1,908	1,888	1,937	(20)	1,525	1,499	1,607	1,657	1.679
Average weight per sheep—	79·8	76·8	83·0	82·1	84·2		76·25	74·95	80·35	82·85	83·95
Percentage—	100	100	108·1	106·9	109·6		100	100	107·2	110·6	112·0

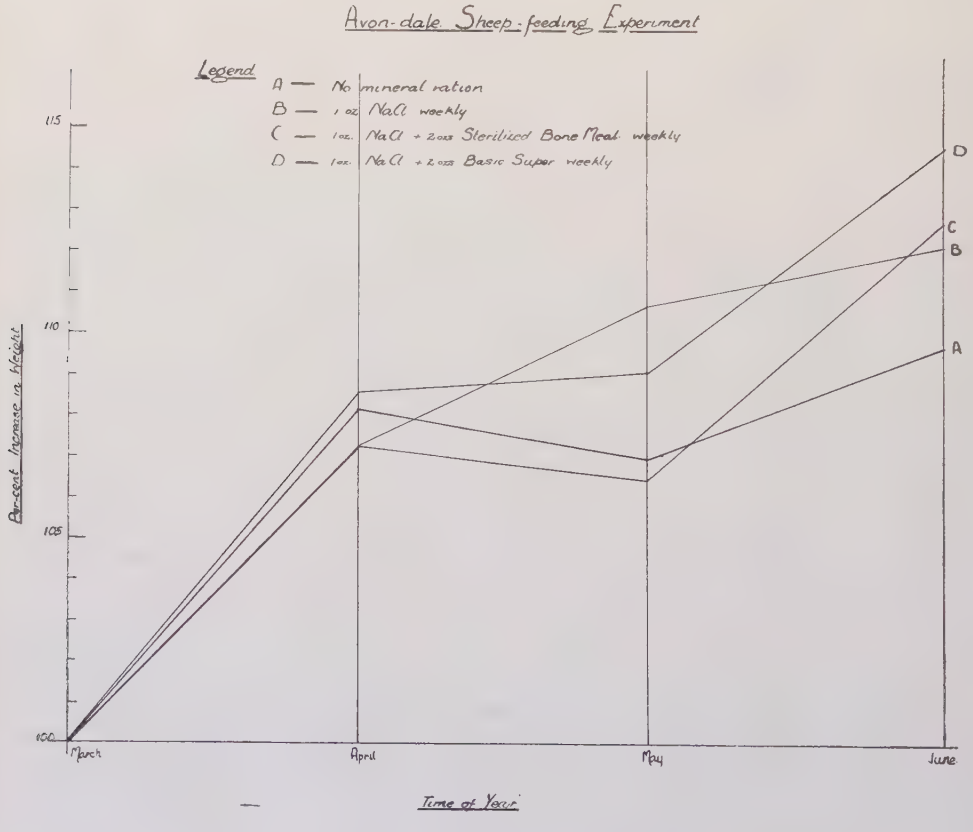
Avondale Farm Sheep Feeding Experiment—continued.

Group C.						Group D.					
2ozs. Sterilised Bonemeal and 1oz. Salt weekly.						2ozs. Basic Superphosphate and 1oz. Salt weekly.					
Sheep No.	Monthly weighings.					Sheep No.	Monthly weighings.				
	1st.	2nd.	3rd.	4th.	5th.		1st.	2nd.	3rd.	4th.	5th.
51 ...	...	...	...	...	...	76 ...	76	71	77	75	83
52 ...	77	76	82	81	86	77 ...	77	78	84	81	88
53 ...	82	80	84	82	87	78 ...	70	69	75	77	81
54 ...	82	79	83	82	86	79 ...	84	80	84	85	87
55 ...	82	76	79	80	84	80 ...	80	80	84	95	88
56 ...	...	...	...	...	...	81 ...	82	80	85	87	88
57 ...	75	69	77	75	80	82 ...	...	...	...	...	..
58 ...	88	85	90	91	94	83 ...	75	74	79	80	83
59 ...	70	67	71	72	76	84 ...	82	76	86	88	94
60 ...	...	...	...	...	...	85 ...	80	73	80	78	81
61 ...	78	69	77	72	79	86 ...	70	69	74	75	80
62 ...	...	...	...	...	...	87 ...	83	75	83	70	89
63 ...	86	79	85	83	87	88 ...	76	74	80	71	84
64 ...	78	77	80	79	83	89 ...	72	66	74	77	76
65 ...	...	...	...	...	...	90 ...	72	66	71	73	78
66 ...	72	74	81	79	75	91 ...	87	84	94	93	104
67 ...	78	65	72	73	76	92 ...	68	65	69	80	77
68 ...	83	83	84	83	89	93 ...	86	85	90	95	87
69 ...	...	...	...	...	...	94 ...	...	...	...	...	...
70 ...	87	69	76	76	83	95 ...	80	79	86	88	91
71 ...	82	72	77	77	82	96 ...	80	73	84	81	87
72 ...	75	72	80	81	89	97 ...	80	72	76	75	80
73 ...	70	68	77	77	81	98 ...	74	70	76	75	76
74 ...	81	77	80	80	89	99 ...	...	...	...	...	...
75 ...	75	72	75	77	80	100 ...	...	...	...	...	...
Totals—											
(19)	1,501	1,409	1,510	1,500	1,586	(21)	1,634	1,599	1,691	1,699	1,782
Average weight per sheep—	79·0	74·2	79·5	78·9	83·5		77·8	74·2	80·5	80·9	84·9
Percentage—	100	100	107·2	106·4	112·6		100	100	108·5	109·0	114·4

It will be seen from a comparison of these results that at the second weighing all groups had continued to lose weight, thus justifying the delay which had taken place in the first weighing and indicating that the sheep had not even by then become accustomed to their new conditions, and that the date of this second weighing, rather than the first one, should be the initial stage from which comparisons should be made. At the next weighing in April there was a general all-round and about an equal average improvement in the weight of the sheep in each group, as may be seen from the following table, showing the respective average weights at the two weighings:—

AVERAGE WEIGHT IN EACH GROUP.

	March.		April.	
	lbs.	per cent.	lbs.	per cent.
Group A	76·80	100	83·00	108·1
Group B	74·95	100	80·35	107·2
Group C	74·20	100	79·50	107·2
Group D	74·20	100	80·50	108·5



The differences between these and averages of previous weighings show that there was a general all round and about equal gain in each group.

The respective average results at the April and May weighings were:—

AVERAGE WEIGHT IN EACH GROUP.

	April.		May.	
	lbs.	per cent.	lbs.	per cent.
Group A	83·00	108·1	82·10	106·9
Group B	80·35	107·2	82·85	110·6
Group C	79·50	107·2	78·90	106·4
Group D	80·50	108·5	80·90	109·0

In no case during this period were the gains of the previous month maintained. Two groups increased their weight, those which received salt only made a gain of 2.6 per cent., and those receiving basic superphosphate made a slight gain or just under ½lb., or .5 per cent. The two other groups lost slightly, and about equal amounts. There is not sufficient data available to explain these divergent results.

During the next period good rains fell, and, in consequence, young green feed became plentiful, with the result that there was an improvement in the average weights in all groups, as is shown in the following table:—

AVERAGE WEIGHT IN EACH GROUP.

	May.		June.	
	lbs.	per cent.	lbs.	per cent.
Group A	82·10	106·9	84·2	109·6
Group B	82·85	110·6	83·95	112·0
Group C	78·90	106·4	83·50	112·6
Group D	80·90	109·0	84·90	114·4

The greatest and about equal gains were recorded by the sheep receiving bonemeal and salt and basic superphosphate and salt; the least gain was recorded by the sheep receiving salt only. The greater gains with the mineral rations indicate a phosphatic deficiency even in the young pasture, and further apparently confirm the conclusions formed by Sir Arnold Thieler and his co-workers, regarding the necessity for sufficient supplies of phosphorus to ensure that animals make the best use of the feed available.

The results of the second—March—weighing, when the sheep were considered to have become accustomed to their new environment, and the succeeding weighings, are shown in graphic form hereunder.

Forty experimental sheep were sold at Midland Junction Saleyards on 12th June (from Group A, 11 sheep, from Group B, 10 sheep, from Group C, 9 sheep and from Group D, 10 sheep). These were examined *post mortem* at Fremantle abattoirs. Specimens were secured for microscopical examination, the result of the examination of the specimens from various groups did not disclose any marked pathological alteration due to any of the minerals fed. Group D, however, showed slight desquamation of epithelium of mucous membrane of small intestine.

The gains made by all groups from the second weighing, which was the lowest recorded and when the sheep had apparently become accustomed to their unfamiliar surroundings and conditions, are very similar with a slight advantage in favour of the group receiving the basic superphosphate, thus indicating that it had not proved harmful.

SEED TESTING.

RESULTS OF SEED EXAMINATION OF SUBTERRANEAN CLOVER FOR THE PAST SEASON, 1929-30, WITH NOTES ON THE OCCURRENCE OF "SEMI-HARD" SEEDS.

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During the past twelve months the examination of all types of agricultural and farm seeds in Western Australia, for purity and germination, has been continued.

In comparing the results of the examination of subterranean clover (*Trifolium subterraneum*) seed for this season with those of the previous twelve months it was noticeable that, whereas last season the germination averaged 62.1 per cent. with 33.6 per cent. of "hard" seeds, this season the germination averaged 70.4 per cent. with 26.9 per cent. of hard seeds, but there was a very unusual occurrence, viz., the finding of "semi-hard" seeds in about 63.0 per cent. of the samples tested.

With reference to the purity of the samples, it can be safely stated that it is on the upward grade; the average purity of the subterranean clover seed for this year was 95.1 per cent. compared with 90.2 per cent. for the last season, or 92.6 per cent. for the seasons 1923-9. There was also a marked decrease this season in the percentage of weed seeds present in samples. The average was only 0.14 per cent compared with 1.63 per cent. for last season, or 0.82 per cent. for the seasons 1923-9.

"Semi-hard" seeds were first noticed in subterranean clover seed in 1928, but only in small percentages. This year, however, they have been remarkably conspicuous, as can be seen from the accompanying tables. It would perhaps be advisable, before continuing, to give a concise definition of just what is meant by "hard" and "semi-hard" seeds.

Hard seeds are normally formed and mature, but do not alter in appearance (remaining inactive for an indefinite period) in a seed bed when placed under the most favourable conditions for sprouting. This hardness is due to the impermeability of the outer skin of the seed preventing the entrance of moisture. All that is necessary to cause germination is to facilitate the access of moisture to the kernel, either by mechanical injury or by softening the skin or outer seed coat.

Semi-hard seeds are intermediate between "hard" and "normal" seeds. They differ from the former in swelling, and from the latter in not germinating in the given time (*i.e.* eight days), unless the outer seed coat or skin has been mechanically ruptured.

The presence of semi-hard seeds in samples of subterranean clover is apparently not confined to West Australian grown and harvested seeds alone, for it will be seen from the accompanying table that they were also present in seeds obtained from South Australia.

RESULTS OF TESTS OF SUBTERRANEAN CLOVER SEED FOR THE SEASON JULY, 1929-JUNE, 1930.

Test No.	Supplier.	Origin.	Purity.	Weeds.	Germination—4 days.	Germination—8 days.	Semi-hard Seeds.	Total Germination.	Hard Seeds.	Actual Value.
			%	%	%	%	%	%	%	
1096 ...	A.	W.A.	93·6	...	37·5	49·0	...	49·0	44·0	45·9
1101 ...	,,	,,	99·0	...	...	29·5	21·0	50·5	45·0	50·0
1108 ...	,,	,,	96·5	...	32·5	49·5	9·0	58·5	37·5	56·4
1120 ...	,,	,,	97·9	...	12·0	21·0	38·0	59·0	35·0	57·7
1121 ...	,,	,,	97·4	Trace	5·0,	22·0	24·0	46·0	37·0	44·9
1122 ...	,,	,,	98·5	,, *	6·5	19·5	48·0	67·5	29·5	66·5
1130 ...	,,	,,	95·1	,,	47·0	51·5	.7·5	59·0	11·5	56·1
1135 ...	,,	,,	98·0	,, *	38·0	41·5	14·5	56·0	30·0	54·9
1137 ...	,,	,,	97·0	,, *	4·0	6·5	34·5	41·0	57·5	39·8
Average	...	...	97·0	Trace	20·3	32·3	21·8	54·0	40·7	52·4
1107 ...	B.	W.A.	98·5	...	53·5	63·5	...	63·5	33·3	62·5
1111 ...	,,	,,	97·3	Trace	53·0	58·0	...	58·0	39·0	56·4
1148 ...	,,	,,	89·0	0·6	53·0	61·5	...	61·5	35·0	54·7
1149 ...	,,	,,	94·0	Trace	55·5	68·5	...	68·5	29·0	64·3
1167 ...	,,	,,	97·0	...	85·5	88·0	...	88·0	12·0	85·3
Average	...	...	95·1	0·1	61·1	67·9	...	67·9	29·7	64·6
1092 ...	C.	W.A.	93·0	0·8	18·0	43·5	28·0	71·5	19·0	66·5
1095 ...	,,	,,	94·8	Trace	63·0	70·0	...	70·0	16·5	66·3
1131 ...	,,	,,	87·5	1·0*	50·0	71·5	15·0	86·5	7·0	75·7
Average	...	...	91·8	0·6	43·7	61·7	14·3	76·0	14·2	69·5
1114 ...	D.	W.A.	93·4	...	82·5	95·5	...	95·5	2·0	89·1
1133 ...	,,	,,	95·3	...	46·0	53·0	46·0	99·0	...	94·3
1142 ...	,,	,,	95·0	Trace	30·0	37·0	50·0	87·0	7·5	82·6
Average	...	...	94·6	Trace	52·8	61·8	32·0	93·8	3·1	88·7
1113 ...	E.	W.A.	98·0	Trace	79·5	79·5	...	79·5	20·5	77·9
1129 ...	,,	,,	96·5	...	43·0	49·5	20·0	69·5	27·5	67·0
Average	...	...	97·3	Trace	61·3	64·5	10·0	74·5	24·0	72·5
1132 ...	F.	W.A.	98·1	...	6·5	24·5	35·0	59·5	29·0	58·4
1136 ...	,,	,,	97·7	...	19·0	23·0	29·0	52·0	35·5	50·4
Average	...	...	97·9	...	12·8	23·8	32·0	55·8	32·3	54·4
1123 ...	G.	W.A.	99·3	Trace	...	...	...	...	...	...
1138 ...	,,	,,	95·5	,,	72·0	73·5	10·0	83·5	12·5	79·7
Average	...	...	97·4	Trace	72·0	73·5	10·0	83·5	12·5	79·7
1119 ...	H.	W.A.	97·6	0·8†	38·0	43·5	20·0	63·5	33·0	62·0
1143 ...	I.	W.A.	96·5	Trace*	11·5	15·0	53·0	68·0	25·0	65·6
1094 ...	J.	S.A.	99·0	Trace	2·5	22·5	41·0	63·5	24·0	62·8
1166 ...	K.	W.A.	82·5	...	62·0	72·0	...	72·0	27·0	59·4

* *Romulea rosea* (Guildford Grass) present. † *Bartsia viscosa* (Yellow Weed) present.

SUMMARY.

Suppliers.	No. of Samples Tested.	No. Samples containing Bad Weeds.	Purity.	Weed Seeds.	Germination—4 days.	Germination—8 days.	Semi-hard Seeds.	Total Germination.	Hard Seeds.	Actual Value.
			%	%	%	%	%	%	%	
A. ...	9	3	97·0	Trace	20·3	32·3	21·8	54·0	40·7	52·4
B. ...	5	...	95·1	0·1	61·1	67·9	...	67·9	29·7	64·6
C. ...	3	1	91·8	0·6	43·7	61·7	14·3	76·0	14·2	69·5
D. ...	3	...	94·6	Trace	52·8	61·8	32·0	93·8	3·1	88·7
E. ...	2	...	97·3	,,	61·3	64·5	10·0	74·5	24·0	72·5
F. ...	2	...	97·9	...	12·8	23·8	32·0	55·8	32·3	54·4
G. ...	2	...	97·4	Trace	72·0	73·5	10·0	83·5	12·5	79·7
H. ...	1	1	97·6	0·8	38·0	43·5	20·0	63·5	33·0	62·0
I. ...	1	1	96·5	Trace	11·5	15·0	53·0	68·0	25·0	65·6
J. ...	1	...	99·0	,,	2·5	22·5	41·0	63·5	24·0	62·8
K. ...	1	...	82·5	...	62·0	72·0	...	72·0	27·0	59·4
	30	6	95·1	0·14	39·8	49·0	21·3	70·2	26·9	66·5

The above table shows that, out of the five samples submitted by supplier B, there were no semi-hard seeds present; this was probably due to the conditions being better during the maturing of the seeds, as they were harvested from a different district to the other samples. The percentage of semi-hard seeds in all samples varied from nil-53.0 per cent., with an average of 21.3 per cent.

Out of the thirty samples tested six, or 20 per cent. of them, had present weed seeds which are not desirable, viz., *Bartsia viscosa* (Yellow Weed) in one sample only, and *Romulea rosea* (Guildford Grass) in five samples. The suppliers of these samples were notified that it would be advisable to re-clean them before selling or sowing.

The percentage germination of samples in four days varied enormously —from nil to 82.5 per cent., with an average of 39.8 per cent. A similar variation is noticeable with the total germination, which ranged from 46.0-99.0 per cent., with an average of 70.4 per cent. This is much higher than the germination of the previous periods, 1923-9, as the range for those years was 30.5-92.5 per cent., with an average of 66.2 per cent.

Owing to the enormous variations in the percentage purity and germination of the samples there is consequently the same variation in the *actual value*. To determine the actual value in any seed it is first required to find, in percentage, the purity and germination capacity. For example, if a given sample contains 95.0 per cent. true seed (or purity) which germinates 60.0 per cent., the actual value for use is $95 \times 60 \div 100 = 57.0$, which means that 57.0 per cent. of the seeds of the sample are pure germinable seeds. This will mean that, if the actual cost is, say, 1s. 6d. for 20 lbs., we pay £1 10s. for what is only worth 17s. 1d. (taking the basis of our calculation as perfection); but if we take the standard as 95 per cent. purity and 70.0 per cent. germination, which has an actual value of 66.5, and still allow 1s. 6d. per lb. for 20 lbs., the sample under discussion is worth $57.0 \times$ £1 10s. $\div 66.5 =$ £1 5s. 8½d. A certain margin of variation below expectation should always be allowed.

In conclusion it is evident from the analysis of the sample for this season, compared with those of the past six seasons, that—

1. There has been a gradual increase in the standard of purity and germination of commercial subterranean clover seed.

2. There has been a gradual decrease in the percentage of weed seeds present in samples.

3. There occurred this season semi-hard seeds in 63 per cent. of the samples tested. These semi-hard seeds were detected in Western Australian seed for the first time in the 1928 season.

BERSEEM OR EGYPTIAN CLOVER

(*Trifolium Alexandrinum*).

J. T. Armstrong, B.Sc. Agric.,
Senior Agricultural Adviser, Dairy Branch.

Berseem clover is very often called winter lucerne because its upright character of growth is similar to that of lucerne, but its period of growth is during winter, hence the name winter lucerne. This winter growth gives the plant its value to the dairy and pig farmer.

Unfortunately not a very great area in this State is suitable for the growth of Berseem clover, and more unfortunate still is the fact that so little of this valuable fodder is planted where conditions are favourable. Berseem requires a district with early autumn rains, so that planting may be done in February, or by the first week in March at the latest. With an early germination, the rooting system will have developed and the plant be nearly a foot high at least before the cold weather comes in. Unless the young plants are well established before the cold weather commences, all growth will be checked and the stand may die out, or the plants may become very bad coloured and stunted and no further growth will be made until the late spring.

In the karri country, in the Denmark area, Berseem does well, preferring the lighter loam to the heavier class of country, which becomes colder and wetter in the winter. A soil containing plenty of humus is preferred for the following reasons:—

1. Humus improves the physical character of the soil, makes it warmer, more mellow, and easier to work.
2. It improves the water-holding capacity of the soil, and this is of great benefit to the plant in the later stages of its growth when the dry weather is setting in.
3. It makes available plant food, both directly and indirectly—directly from the minerals it contains; indirectly by aiding soil bacteria in their work of preparing plant foods and by the action of acids in dissolving the more insoluble minerals in the soil.

The land should be thoroughly well worked, ploughed early in spring and then harrowed until a fine tilth is obtained, if the area is dry. In Denmark an early crop of maize can be taken off in January, and the land then prepared for Berseem. Where possible, deep ploughing is recommended to allow the roots plenty of soil space, and to ensure that there is no hard pan three or four inches down.

Seed can be broadcast and harrowed or drilled in, using 10 to 12 lbs. per acre if broadcast, and about half that amount if drilled. In the writer's opinion drilling is preferable, because the depth of planting can be regulated, and the manure is put down in the same drill as the seed. If broadcasted, the seed must be covered and the type of mulch will determine the method to be used. Sometimes a T-Bar roller is used, sometimes a light tyne harrow, other times merely a brush harrow. No hard and fast rule can be laid down. The farmer must use the method best suited to his soil. The only set rule is that the seed needs to be covered, but must not be covered too deeply.

Manure generally used is superphosphate at the rate of 2 cwts. per acre, and, if the plants look pale and spindly, a top-dressing of sulphate of ammonia at the rate of 25 to 50 lbs. per acre is given. In the writer's opinion, 25 lbs. sulphate of ammonia is advisable in that it forces the growth and enables the plants to be well advanced before the cold weather sets in.

If planted in February the first cut will be late in May, and the next probably in August, because growth during the winter is slow; but from August to December a cut can be made every month. Cutting should take place when the first flowers are beginning to appear. Well-grown plants are then about 18 inches to two feet high. If the stand is allowed to seed, no further growth will take place; so permitting it to seed should be avoided.

Three demonstration plots were put in by the writer at Denmark last year on holdings belonging to H. Harris, E. Bastiani, and J. Pommeroy.

On Mr. Harris' block the stand was disappointing. The soil was inclined to be heavy; it was new land and had not been sufficiently well worked. This stand was not cut but was grazed off when about a foot high, and gave four grazings.

The stand at E. Bastiani's holding was excellent. The soil was a light karri loam which had been well worked and had been previously cropped. It was seeded at the rate of 10 lbs. per acre; and superphosphate was applied at the rate of 2 cwt. per acre. The first cut was in June and yielded 2½ tons per acre; cut next in September, and gave 5 tons per acre; two other cuts equally as good were obtained, and finally, late in December, it was grazed down.

An equally good stand was obtained at Mr. Pommeroy's farm. The plot had carried maize until late January, and the land was ploughed and then worked down to a fine tilth and seeded on 5th March with 10 lbs. seed and 2 cwt. superphosphate per acre; the seed was harrowed in. In June two tons per acre were obtained, and the second cut in September gave four tons per acre. Subsequent monthly cuts until December gave approximately 3½ tons per acre, until the land became too dry late in December.

These plots yielded from 15 to 20 tons of green fodder per acre.

After cutting in June, and September particularly, a light harrowing gives good returns. The mulch for seeding is fine and is packed down by the heavy winter rains, and harrowing opens up the soil and permits aeration. All plant roots require air for respiration, and leguminous plants need an extra supply to enable the bacteria living in the root nodules to build up nitrates which the plant can use.

Berseem is a particularly valuable fodder plant for dairy cows and for pigs. It is a leguminous plant, and supplies protein to the stock and saves purchasing bran. It is very succulent, and is in this respect more valuable than lucerne.

Sows do extremely well on Berseem; it encourages the flow of milk, thus the suckers get a better start in life, and are ready sooner for the butcher, and porkers and baconers do better with the addition of Berseem to their ration of grain and skim milk.

Summarised briefly:—

Berseem is valuable in districts where it can be sown to germinate by the middle of March at the latest.

Land should be of light loamy character, well drained and warm, containing a good supply of humus.

Good cultivation is necessary.

Seeding should take place early in autumn—February or March.

Manuring should be applied at the rate of 2 cwt. superphosphate and 25 lbs. sulphate of ammonia per acre.

Cover seed lightly.

Cut before the plants have seeded and harrow lightly after cutting, particularly in the winter months.

A light topdressing of superphosphate after each cutting is beneficial.

Berseem may be fed to cows in place of bran.
Increases the flow of milk in sows and aids growth of sucking pigs.
Valuable as an addition to grain for fattening pigs.
Is a leguminous plant and valuable in rotation of crops by improving nitrate content of soil.
Yields of 20 tons per acre can be easily obtained by proper methods of farming, and a big percentage of this is obtained during the winter months when other plants are checked by the cold.
Does well at Denmark, and should do well in the Manjimup area, also in Margaret River and Augusta areas.
Where irrigation for February planting is possible, it will do well even though winter rains are late.
Unless the plants get away early in autumn, no yield can be expected.

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

CATALOGUE OF SCIENTIFIC AND TECHNICAL PERIODICALS IN THE LIBRARIES OF THE COMMONWEALTH OF AUSTRALIA.

Workers in all branches of science in agriculture, in medicine, in the technical and other fields are always handicapped by the difficulties of obtaining the literature necessary for their work. It is manifestly impossible for the private worker to accumulate for himself a library adequate to his needs. The worker in departments or institutions, although in a better position, has constant need to refer to libraries other than his own in order to be able to keep abreast with the literature in his subject.

In Australia, investigators are particularly handicapped by difficulties inevitable in a country where technical libraries are relatively few and distances between them often very great. While these disabilities cannot be completely remedied, they can be considerably reduced by making readily available a catalogue of the contents of these libraries. A publication of this description enables the worker to locate without a waste of time the literature that he requires.

In so far as periodicals are concerned, and it is periodicals that are of paramount importance to the average worker, a catalogue designed to serve this purpose has now been published by the Commonwealth Council for Scientific and Industrial Research. This Catalogue, which has been prepared under the editorship of Mr. E. R. Pitt, of the Melbourne Public Library, includes periodicals (in all languages) of a scientific and technical nature and also the publications issued serially by Government Departments, Institutions and Societies in all countries. In all, 132 Australian libraries have been catalogued. Included in these are the public libraries, the parliamentary libraries, and the libraries of Government departments, of the Universities, the Scientific Societies and Institutions in each State.

A copy of this Catalogue will be found invaluable not only on the shelves of all libraries but also to medical men, technical chemists, engineers, architects, veterinarians, and those engaged in agricultural research, in public health and sanitation matters, and to all classes of builders and manufacturers. Throughout the preparation of the Catalogue special attention has been paid to Australian publications, and it will therefore serve as a record of all periodicals of a scientific and technical nature that have been published in Australia.

THE MERCHANTS' GIFT TO RESEARCH.

THE MERCHANTS' AGRICULTURAL RESEARCH FUND.

GEO. L. SUTTON,
Director of Agriculture.

Shortly after the Hon. M. F. Troy, Minister for Agriculture, announced that it was the intention of the Government to establish an Agricultural College, and that "Muresk" had been purchased for the purpose, the merchants of this State voluntarily started a movement with the object of raising £10,000 to endow one of the activities of the College.

The first step which led to the inauguration of the Merchants' Agricultural Research Fund was taken in 1922 when the writer approached the late Hon. George Swinburne, one of the Trustees of the McCaughey bequest, to ascertain if the trust could make a grant towards the establishment of an agricultural college in Western Australia, at which beneficiaries under the bequest might be trained in agriculture. About that time there were some 20 sons of deceased or incapacitated soldiers in Western Australia to whom it was desired to give such training. After consideration it was decided by the trustees that it was impossible to accede to the request without obtaining a special order from the Victorian Court. Mr. Swinburne, however, was deeply and sincerely interested in the proposal for the establishment of an Agricultural College, and approached the Mt. Lyell Fertiliser Co., of which he was Chairman of Directors, and also invoked the sympathy of Messrs. Cuming, Smith & Co., the only other fertiliser company at that time manufacturing superphosphate in this State. Each of these companies decided to donate £500, and in addition they arranged for the active co-operation of merchants in Western Australia.

The next step was a meeting of the firms acting as distributors for the superphosphate companies, and this meeting decided to call the merchants of Perth and Fremantle together in order to forward this movement. This general meeting was held in the Builders' Exchange on 26th November, 1924, and was presided over by the then President of the Perth Chamber of Commerce, Mr. H. W. D. Shallard. At this meeting it was decided to proceed with the collection of funds, and the following motion, which formally brought the fund into being, was moved by Mr. T. E. Field and seconded by Mr. W. Padbury:—

> "That, with a view to the improvement of agricultural practice in Western Australia, this meeting of Perth and Fremantle merchants is of opinion that a fund should be established for the endowment of scientific research at the Muresk College, the fund to be known as the 'Merchants' Research Fund.'"

At this meeting a resolution moved by Mr. W. Stowe and seconded by Mr. A. Sandover was also carried; this was as follows:—

> "That, except where otherwise directed by the donors, the moneys collected be placed under the control of trustees for investment in Government bonds, the interest therefrom to be devoted to the advancement of scientific research at the Muresk Agricultural College."

Further, an executive committee was appointed at this meeting; those who accepted were Messrs. John Black, T. E. Field, Hugo Fischer, E. F.

Fairey, J. Gemmel, Jas. M. Macfarlane, H. D. McCallum, A. H. Malloch, C. S. Nathan, Wm. Padbury, B. Perry, R. Purser, W. A. Ross, R. Russell, A. Sandover, Professor E. O. G. Shann, Messrs. Geo. L. Sutton, R. Telford, H. J. Wigmore (Chairman), and Wilmott Y. Cooke (Secretary).

Following upon this meeting the committee set actively to work with the result that £9,226 17s. had been collected by the 30th October, 1925; the total collection expenses were £122 9s. 11d., or only 1-1/3rd per cent. of the total. Since then further donations amounting to £605 15s. have been received, so that the total amount donated is £9,832 12s., or nearly the £10,000 which was the goal aimed at.

A meeting of the doners was held on 30th October, 1925, and as arrangements had been made for the donations as received to be invested, the sum to the credit of the fund—the donations with the interest earned—exceeded £10,000. At this meeting of donors a resolution was carried appropriating a sufficient amount of the accrued interest to raise the capital to £10,000; the following resolution was also carried:—

> "That the capital fund be handed over under a proper deed of trust to the West Australian Trustee, Executor, & Agency Co., Ltd., for perpetual endowment of the research work at or connected with the Muresk Agricultural College."

The sum of £10,000 was accordingly paid over to the Trustee Company. At the final meeting of the donors on the 23rd of February, 1926, it was resolved that the Trustee Company be directed to invest the said sum of £10,000 in Western Australian Government bonds; the company thereupon purchased from the Treasurer of the State of Western Australia bonds to the value of £10,000, maturing on the 1st of May, 1947, bearing interest at the rate of £5 10s. per centum per annum, in half-yearly payments on the 1st day of January and 1st day of July each year, until the date of maturity or redemption.

Under the deed of trust a board of advisers consisting of the following members was appointed:—The Presidents of the Perth and Fremantle Chambers of Commerce, the Professor of Agriculture, the Director of Agriculture, and another member to be co-opted by those named. As the result of a wish expressed by the meeting of subscribers in February, 1926, Mr. H. J. Wigmore, who had been acting as chairman of the committee, was co-opted and appointed as chairman of the board of advisers at the first meeting held on 12th January, 1928. Fifteen meetings of the board of advisers have been held periodically as was found necessary. In addition to the Chairman (Mr. H. J. Wigmore), the Professor of Agriculture of the University of Western Australia (Professor Paterson) and the Director of Agriculture (Mr. Geo. L. Sutton) the following gentlemen have also officiated as members of the board:—Messrs. R. A. Cameron, H. S. Bickford, E. S. Lazarus and B. Rosenstamm, representing the Perth Chamber of Commerce, and Messrs. S. T. Edwards and J. W. Bateman, representing the Fremantle Chamber of Commerce.

Though the fund has an annual income of about £550, the board of advisers felt that it was advisable that the interest should be allowed to accrue in order to provide for equipment and other contingencies which would be necessary in addition to the salary of the investigator. Whilst the necessary accumulation of interest was taking place various subjects for research were considered and it was very early decided that the subject for research should

be that dealing with the construction, efficiency, and economy of agricultural machinery, having special regard to the draught of ploughs, mouldboard and disc, as affected by different factors, such as—

Type of plough;
Cross section of furrow;
Depth;
Moisture; and
Previous crop.

This proposal was not proceeded with, as the board of advisers considered sufficient reserves had not accumulated to justify its commencement. In the meantime, as a result of further consideration, and in consequence of the great need which had arisen for pasture research, it was decided that the original proposal should give way to "an investigation (agrostological) in connection with pasture improvement and management."

On the 31st December last the total sum to the credit of the fund was £11,945 16s. 9d. Of this amount the sum of £10,605 15s. was the capital endowment, being £10,000 made up of donations and interest appropriated on 30th October, 1925, and donations amounting to £605 15s. received subsequent to that date. The balance, £1,340, is accumulated interest, and is a reserve from which the annual interest can be supplemented, in order to provide equipment and other essentials for the research worker, for which the annual income after providing for his salary will not be sufficient. The amount of this reserve is now regarded as sufficiently large for arrangements to be made for undertaking the first investigation.

It is desired, if possible, to secure a West Australian research worker, and with this object in view the Principal of Muresk Agricultural College and the writer have been in communication with two graduates of the West Australian University, who are now abroad, one studying in California and the other at Cambridge, with the purpose of securing the services of one of them to undertake this research.

On Monday, 10th March last, after presenting the diplomas at the Muresk Agricultural College, the Hon. H. Millington, then Minister for Agriculture, unveiled a tablet commemorating the endowment of Agricultural Research at the College. This tablet is a handsome bronze one 4ft. 6in. long and 2ft. 6in. wide, mounted on a polished jarrah board, and records in permanent form the names of the donors and also the executive committee who were responsible for the collection of the fund. The names of the donors, and the amount subscribed by each, are as hereunder:—

MERCHANTS' AGRICULTURAL RESEARCH FUND.

Names of Donors and Amounts.

	£	s.	d.
Adams Motors, Ltd.	100	0	0
Aherns, Ltd.	10	10	0
Alston, James and Sons, Ltd.	10	10	0
Anderson, Arthur, Ltd.	20	0	0
Armstrong Cycle and Motor Agency	25	0	0
Arnott, C. W.	21	0	0
Arundel, E., and Co.	50	0	0
Atkins (W.A.), Ltd.	250	0	0
Attwood, Wm.	25	0	0
The Bairds Co., Ltd.	25	0	0
Bales, Arthur, Ltd.	5	0	0
Barton, H. A.	10	10	0
Bateman, J. and W., Ltd.	50	0	0
Boans, Ltd.	500	0	0
Boronia Flour Mills, Ltd.	50	0	0
Bon Marche, Ltd.	10	10	0
British Imperial Oil Co., Ltd.	25	0	0
Brown and Dureau, Ltd.	75	0	0
Burridge and Warren, Ltd.	25	0	0
Bunning Bros., Ltd.	20	0	0
Carter, Charlie, Ltd.	10	10	0

MERCHANTS' AGRICULTURAL RESEARCH FUND—*continued.*

Names of Donors and Amounts.

	£	s.	d.
Castlemaine Brewery, Ltd.	25	0	0
Cadd, Frank, Co., Ltd.	5	5	0
Carbarns and Co., D. F.	10	10	0
Charles, Joseph	10	10	0
Collins, W. M., and Co.	15	15	0
Corrigin District Farmers Co-op. Co., Ltd.	10	0	0
Cuming, Smith and Co., Pty., Ltd.	500	0	0
Craiks, Ltd.	10	0	0
Crooks and Brooker, Ltd.	10	0	0
Dalgety and Co., Ltd.	250	0	0
Denny Bros., Ltd.	100	0	0
Dimmitt, J. A., Ltd.	10	0	0
Distillers Agency, Ltd.	10	10	0
Drew, Robinson and Co.	50	0	0
Edwards, H. M.	10	10	0
Elder, Smith and Co., Ltd.	250	0	0
Emu Brewery, Ltd.	50	0	0
Falk and Co., Ltd., P.	25	0	0
Felton, Grimwade and Bickford	25	0	0
Fischer, Hugo, Ltd.	100	0	0
Forward, Down and Co., Ltd.	10	0	0
Foy and Gibson Pty., Ltd.	300	0	0
Foy, Jefferson	50	0	0
Ford, Rhodes and Davies	21	0	0
Fremantle Stevedoring Co., Ltd.	21	0	0
Gibbs, Bright and Co.	75	0	0
Gilberts, Ltd.	50	0	0
Goldsbrough, Mort and Co., Ltd.	50	0	0
Goode, Durrant and Co., Ltd.	250	0	0
Grave and Dwyer	100	0	0
Great Southern Roller Flour Mills, Ltd.	50	0	0
Harald and Co.	5	0	0
Harris, Scarfe and Sandovers, Ltd.	100	0	0
Hawkins, J. B.	10	10	0
Haynes and Clements	10	0	0
Harold and Murray	5	5	0
Holmes, Richard, and Co.	50	0	0
Hodd, Cuthbertson and North, Ltd.	10	10	0
International Harvester Co. of Aust. Pty., Ltd.	100	0	0
Johnson, R., and Co.	5	5	0
Joyce Bros. (W.A.), Ltd.	25	0	0
Knight, Digby	21	0	0
Laurie, Capt. R.	10	10	0
Law, R O.	25	0	0
Lazarus, E. S. and Co., Pty., Ltd.	10	10	0
Lalor, T.	5	0	0
Ledger, J. and E.	10	0	0
Levinson and Sons	10	10	0
Learmonth, Duffy and Co.	10	10	0
Lynn, R. J.	500	0	0
Macfarlane, J., and Co., Ltd.	20	0	0
Malloch Bros	150	0	0
Makower, McBeath Pty., Ltd.	25	0	0
McCallum, A. C., Ltd.	30	0	0
McKay, H. V., Pty., Ltd.	500	0	0
McLean Bros. and Rigg	25	0	0
McIlwraith, McEacharn, Ltd.	100	0	0
Millars' Timber and Trading Co., Ltd.	150	0	0
Mitchell and Co. Pty. Ltd.	50	0	0
Moore, Chas., and Co.	10	10	0
Mills and Ware	25	0	0
Mofflin, H. E., and Co., Ltd.	50	0	0
Murray, D. and W., Ltd.	100	0	0
Musgroves, Ltd.	20	0	0
Mt. Lyell Chemical Works	500	0	0
Narrogin Trading and Agency Co., Ltd.	10	0	0
Nicholsons (1911), Ltd.	10	10	0
Nicholls and Co., Ltd.	10	10	0
Paterson and Co., Ltd.	250	0	0
Pearls, Ltd.	5	5	0
Peerless Roller Flour Mills, Ltd.	100	0	0
Perth Motor Garage	10	0	0
Perth Roller Flour Mills	100	0	0
Purser, Richard, and Co.	150	0	0
Red Castle Brewery	12	12	0
R.M. Co-op., Ltd.	25	0	0
Robinson, John	10	0	0
Robinson and Co., T.	100	0	0
Robertson Bros., Ltd.	10	0	0
Rosenstamm, B.	100	0	0
Sargood Bros.	10	10	0
Saunders and Stewart Pty., Ltd.	21	0	0
Sampson, R. S.	10	0	0
Sainsbury, W. E., and Co.	5	0	0
Sewell and Poole	20	0	0
Shearer, John, and Sons, Ltd.	50	0	0
Shearer, David, Ltd.	50	0	0
Sharpen and Riches	10	0	0
Skipper Bailey Motor Co., Ltd.	100	0	0
Stephenson, H. A., and Sons, Ltd.	25	0	0
Stewart Dawson and Co., Ltd.	21	0	0
"Sunday Times"	250	0	0
Swan Brewery Co., Ltd.	105	0	0
Thomas and Co., Ltd., W.	100	0	0
Unbehaun and Johnstone, Ltd.	10	0	0
Vetters, Ltd.	5	0	0
Vacuum Oil Co. Pty., Ltd.	15	15	0
Victoria District Co-operative Flour Milling Co., Ltd.	10	10	0
Wagin Flour Milling Co. Ltd.	10	10	0
Westralian Farmers, Ltd.	250	0	0
W.A. Rope and Twine Co., Pty., Ltd.	50	0	0
"West Australian" Newspapers, Ltd.	500	0	0
West Australian Boot Co.	25	0	0
Weir, J. L. B., and Co.	25	0	0
White, Daniel, and Co.	25	0	0

MERCHANTS' AGRICULTURAL RESEARCH FUND—*continued.*

Names of Donors and Amounts

	£	s.	d.
Wigmore and Co., Ltd., H. J.	500	0	0
Wills, Henry, and Co.	50	0	0
Wills, W. D. and H. A. (Aust.), Ltd.	25	0	0
Winterbottom Motor Co., Ltd.	100	0	0
Wood, Son and Co., G.	25	0	0
Wunderlich, Ltd.	10	10	0
Wright and Co., Ltd., F. W.	10	10	0
York Flour Milling Co., Ltd.	50	0	0
	£9,832	12	0

In the older and wealthier Eastern States there have not been wanting generous donors who have subscribed most liberally for the purpose of carrying forward the torch of educational and academic progress, and in this State public-spirited men have to a lesser extent, but with the same commendable spirit, helped in the same direction by means of endowments and scholarships. For the merchants collectively to do this is, however, unique in Australia. Indeed, it is very doubtful whether in any other capital city of the Commonwealth such a project would have been entertained, or could have been carried to complete fruition, as has been the case in Western Australia. That it has succeeded is characteristic of the great interest and belief in our agricultural possibilities that is possessed by the mercantile community.

Merchants, as business men, are usually associated with things that are directly useful, and therefore it is a little surprising to find that their gift is to be devoted to research purposes, for research is more concerned about ascertaining the "why" of things than about direct benefits. This attitude, however, shows a keen appreciation of the very real value of research to industry, and is only in keeping with the most advanced views which were very clearly expressed by Sir John Russell, Director of the famous Rothamsted Experiment Station, in an address at Toronto, Canada, when he said:—

> "The nineteenth century took the view that agricultural science was justified only in so far as it was useful. That view we now believe to be too narrow. The practical purpose is, of course, essential; the station must help the farmer in his daily difficulties—which necessitates co-operation between the practical grower and the scientific worker. But history has shown that institutions and investigators that tie themselves down to purely practical problems do not get very far; all experience proves that the safest way of making advances, even for purely practical purposes, is to leave the investigator unfettered. Our declared aim at Rothamsted is 'to discover the principles underlying the great facts of agriculture and to put the knowledge thus gained into a form in which it can be used by teachers, experts and farmers for the upraising of country life and the improvement of the standard of farming.'"

Not only have the merchants been generous, but in providing that their gift shall be utilised for research purposes they have been broad gauged and far-seeing for, as has been shown by the work and results at Rothamsted and other experiment stations, "Research" is the key to agricultural advancement.

Though the research worker in his endeavour to ascertain the "why" of things may be investigating matters which are apparently of no direct value to industry, yet later oftentimes the results have proved of transcending importance. A striking instance of this is the use of mineral superphosphate in agriculture to-day throughout the world. Who could have foreseen the

MERCHANTS' AGRICULTURAL RESEARCH FUND

THIS TABLET

COMMEMORATES THE ENDOWMENT OF AGRICULTURAL RESEARCH AT THIS COLLEGE BY THE FOLLOWING DONORS IN ACCORDANCE WITH THE TRUST DEED DATED 14TH DAY OF APRIL 1927.

Adams Motors, Ltd.,
Aherns, Ltd.
Alston, James & Sons, Ltd.
Anderson, Arthur, Ltd.
Armstrong Cycle and Motor Agency.
Arnott, C. W.
Arundel, E., & Co.
Atkins (W.A.), Ltd.
Attwood, Wm.
Bairds Co., Ltd.
Bales, Arthur, Ltd.
Barton, H. A.
Bateman, J. & W., Ltd.
Boans, Ltd.
Boronia Flour Mills, Ltd.
Bon Marche, Ltd.
British Imperial Oil Co., Ltd.
Brown & Dureau, Ltd.
Burridge & Warren, Ltd.
Bunning Bros., Ltd.
Carter, Charlie, Ltd.
Castlemaine Brewery, Ltd.
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Carbarns & Co., D. F.
Charles, Joseph.
Collins, W. M., & Co.
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Emu Brewery, Ltd.
Falk & Co., Ltd., P.
Felton, Grimwade & Bickford.
Fischer, Hugo, Ltd.
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Great Southern Roller Flour Mills, Ltd.
Harald & Co.
Harris, Scarfe & Sandovers, Ltd
Hawkins, J. B.
Haynes & Clements.
Harrold & Murray.
Holmes, Richard, & Co.
Hodd, Cuthbertson & North, Ltd.
International Harvester Co. of Aust. Pty., Ltd.
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Joyce Bros. (W.A.), Ltd.
Knight, Digby.
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Ledger, J. & E.
Levinson & Sons.
Learmonth, Duffy & Co.
Lynn, R. J.
Macfarlane, J., & Co., Ltd.
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Millars' Timber & Trading Co., Ltd.
Mitchell & Co. Pty., Ltd.
Mills & Ware.
Moore, Chas., & Co.
Moffiin, H. E., & Co., Ltd.
Murray, D. & W., Ltd.
Musgroves, Ltd.
Mt. Lyell Chemical Works.
Narrogin Trading & Agency Co., Ltd.
Nicholsons (1911), Ltd.
Nicholls & Co., Ltd.
Paterson & Co., Ltd.
Pearls, Ltd.
Peerless Roller Flour Mills, Ltd.
Perth Motor Garage.
Perth Roller Flour Mills.
Purser, Richard, & Co.
Red Castle Brewery.
R. M. Co-op., Ltd.
Robinson, John.
Robinson & Co., T.
Robertson Bros., Ltd.
Rosenstamm, B.
Sargood Bros.
Saunders & Stewart Pty., Ltd.
Sampson, R. S.
Sainsbury, W. E., & Co.
Sewell & Poole.
Shearer, John, & Sons, Ltd.
Shearer, David, Ltd.
Sharpen & Riches.
Skipper Bailey Motor Co., Ltd.
Stephenson, H. A., & Sons, Ltd.
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"Sunday Times."
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White, Daniel, & Co.
Wigmore & Co., Ltd., H. J.
Wills, Henry, & Co.
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Wunderlich, Ltd.
Wright & Co., Ltd., F. W.
York Flour Milling Co., Ltd.

THE EXECUTIVE COMMITTEE RESPONSIBLE FOR THE COLLECTION OF THE FUND £10,000 WAS

JOHN BLACK.
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H. J. WIGMORE, Chairman.

WILMOT COOKE, Secretary.

Tablet unveiled at Muresk, 10th March, 1930, by the Hon. H. Millington, M.L.A., Minister for Agriculture.

effect of Liebig's research work when he discovered in 1840 the action of sulphuric acid on bones, and its subsequent extension to mineral phosphates by Lawes and Gilbert in 1842? The result to us is superphosphate as we know it to-day in Australia. Who is bold enough to say that the development following upon the discovery of Liebig, viz., the commercial manufacture of superphosphate, is not the greatest of the benefits conferred upon Australian agriculture?

Another striking instance, and this in a different field, is that of the discovery of the Babcock method of testing milk. Here, as the result of patient research work in the laboratory, a method which revolutionised the butter industry and made it possible to place it upon a sound commercial footing was given freely to the world.

Finally, of numerous other instances, let us not forget the work of those research workers, the early wheat breeders, Wm. J. Farrer, Hugh Pye and Richard Marshall, who, as the result of their great unostentatious work (sometimes ridiculed because not understood) have added so much wealth to our wheat farmers and extended so widely our wheat areas.

Truly has it been said of research that—

> "The agriculture of whole sections of our country, upon which the livelihood of many thousands of people depends, may be entirely changed by experiments in an attic laboratory or by the work of a single man in his own back garden."

The Merchants' Agricultural Research Fund was brought into being by the spirit of National service, its motive is altruistic. Research in the past has, however, conferred benefits in unexpected directions, and agriculturists, whom this fund was designed to benefit, I am sure, will be pleased if the benefits prove to be reciprocal. In this connection it is hopeful to recall further words of the great Liebig, who, in his epoch-making address to the Chemical Section of the British Association for the Advancement of Science stated:—"Perfect agriculture is the true foundation of all trade and industry —it is the foundation of the riches of States."

Less than two decades ago, the wheat lands East of Meckering were not established, it is less than a decade since the possibilities of our Dairy Belt were realised. Having discovered our agricultural lands, it is now our duty to develop their productivity. The merchants' gift to "Muresk" will assist this to be done.

HORTICULTURAL NOTES.

Geo. W. Wickens,
Superintendent of Horticulture.

APPLES.

In spite of the dry summer experienced fruit buds are numerous, plump and healthy-looking on all varieties of apple-trees, and following on the light crop of season 1929-30 there is every reason to expect a heavy yield in 1930-31. Pruning will be in full swing when this Journal appears in June, and I will again offer the advice given in the March issue to prune fruiting wood heavily as one of the essential steps to take towards preventing an overcrop of under-sized fruit.

At time of writing—May—there are still a few small lines of apples being shipped to Java and Singapore, but the bulk of the export finished in April, and the total is meagre when compared with that of 1929. In that year 821,014 cases were sent away from Western Australia, 160,000 to the Eastern States and the balance to countries outside of Australia. From 1st January to 30th April this year the quantity exported only amounted to 145,776 cases. Of these Great Britain received 26,001 cases, the Continent of Europe 98,505, and the remainder were distributed amongst Singapore, Java, Port Said, Colombo, and Bombay. Returns to hand at present do not cover enough of the season to show how the prices obtained will compare with last year's, but it is pleasing to learn from the Agent General that the fruit on the first boats was in a much superior condition this season to that received on the first boats in past seasons, and shows that the lesson we have learned of the folly of shipping immature fruit is having a good effect.

The light crop this season is not the only feature, unfortunately, which apple growers will carry forward as an unpleasant recollection, 1930 having also the distinction of being the year when we first definitely ascertained that Apple Scab—*Venturia inequalis*—was present in the State. So far only two orchards are known to be infected, but it is quite possible, in fact probable, there are others where the infection is so slight as not to have been noticed, but where it may show up next spring, and should it appear it must be fought vigorously, for when it obtains a firm hold it is one of the worst diseases that apple growers have to contend with. The subject is fully dealt with by the Plant Pathologist in this issue of the Journal.

PEARS.

The pear crop in season 1929-30 was a good one, and would have been much heavier if Pear Scab—*Venturia pirina*—had not severely damaged the fruit in many orchards. The in-and-out results obtained by spraying with the same mixtures in different orchards by different operators were again most noticeable. Some growers suffered no commercial loss after thoroughly spraying once only with the 6-6-50 formula (6 lbs. bluestone, 6 lbs. freshly burned lime, 50 gallons of water) at the pinking stage of blooming; while others in the same district who state they applied the same spray at the same time had nearly 100 per cent. of the fruits badly damaged. In following this matter for several years past I have noted

that in orchards where successful control, as stated above, has been obtained, trees which have been left unsprayed (sometimes intentionally, sometimes inadvertently) have invariably carried a big percentage of infected fruit, showing there was no special immunity from the disease in those orchards, and that the different results obtained in places where spraying was ineffective must have been due to a difference in the time or the method of application. In some instances, last spring, spraying with lime sulphur at a strength of 1 in 40, after the fruit had set, did considerable damage in causing the fruit to fall, and it is evident that if hot weather is experienced either at, or shortly after, spraying, lime sulphur at the strength named is dangerous. If the first spraying with Bordeaux 6-6-50 has been thoroughly applied, it is better to risk some loss with scab than use lime sulphur in warm weather for a second spray. Anything over 75° F. shade temperature is dangerous.

The quantity of pears exported from Western Australia from 1st January to 30th April amounted to 22,090 cases, Great Britain receiving 13,834, Europe 7,848, and the balance of 408 was sent to Java and Singapore.

CITRUS FRUITS.

In spite of the dry summer orange trees in most orchards have carried their fruit well, and while the total number of cases produced will be somewhat less than was anticipated earlier in the season owing to the fruit, particularly Valencias, being smaller than usual, I think the crop will amount to 240,000 cases, which, if obtained, will be above the average annual production by about 34,000 cases.

The mandarin crop I estimate at 14,000 cases—a little below the average—and the lemon crop about normal, with 55,000 cases.

GRAPES—FRESH AND DRIED.

The crop of table grapes for season 1929-30 has been good, and the quality likewise. From 1st January to 30th April 39,925 cases were exported to overseas markets, Colombo receiving the most with 18,135 cases, Great Britain next with 11,500, Singapore 5,173, and the balance of 5,117 was divided amongst Java, Bombay, Port Said, Hamburg, and Rotterdam. Further consignments have been despatched to Colombo, Singapore, and Java during May, and the season's total export will be well over 40,000 cases.

In dried vine fruits currants are Western Australia's principal production. This season the lack of rain in summer has favoured successful drying, and the quality is particularly good.

From 10th March to 28th April 627 tons 19 cwts. of currants and 97 tons 6 cwts. of lexias were shipped from Western Australia to Great Britain.

SELECTING THE BREEDING EWES.

Hugh McCallum,
Sheep and Wool Inspector.

There are many farmers who do not realise the importance of the ewe in building up a flock to the ideal aimed at by the breeder. It is essential that they should be carefully selected for their requisite qualities. Leading characteristics which a ewe should possess are, first and foremost, constitution, conformation, trueness to type, vitality, fertility and good bone.

The following are detailed points of a good serviceable ewe that can be purchased, off shears, every year from the leading breeders in the State:—A well-shaped head; a broad and full forehead; clean open face; a mouth without defect; neck of fair length to enable the animal to feed comfortably, being well set in at the shoulders and tapering to the head; shoulders full and deep, with a good depth and width through from shoulder to shoulder to give plenty of room inside for the vital organs to do their work properly; withers full and rounded, the back even and straight and not too long; good bone in the legs: strong springy pasterns, good hocks and fetlocks. Constitution is the foundation of the animal.

When both ewes and rams are selected, with proper regard to strong robust constitutions, this characteristic is disseminated throughout the flock, and results in strong, healthy progeny, if the holding is not over-stocked or the flock underfed. A study of the pastures is essential and the progress of the stock must be watched. With sound vitality, the ewes can stand reverses, but should be looked after, especially during gestation and at lambing-time. Fertility is essential; no ewe that has failed to produce lambs should be on the farm. There are too many unproductive ewes retained on the farms, year after year, for reasons difficult to understand.

If the ewes are not classed every year, the undesirable sheep will retard the flock's improvement. Ewes with any of the following faults should be culled out—broken or defective mouth; weak constitution; showing the grip; scraggy necked; weak shoulders; slab-sided; narrow hind-quarters; thin bone; faulty udder; defective hocks or fetlocks; narrow-chested; tucked-up appearance or deformed sheep; and all animals growing wool that is uneven, dull, yellow-coloured, heavy conditioned or very short in length of staple.

In building up a flock every endeavour should be made to secure a good line from a well known sheep-breeder, off shears, known as cast for age ewes, not cull *ewes* of sound mouth. Broken-mouthed sheep, even though they are cheap, should never be purchased, as they are always a trouble to the purchaser. It is wise not to bargain unduly over the price required by the vendor, bearing in mind the time, cost and work involved in breeding up a high-grade uniform flock. By starting on sound lines many years of

patient work in selecting, mating, breeding and culling are saved; besides the usual disappointments the breeder experiences. Success or failure will then depend entirely on the farmer's own ability in selecting the rams required, mating them with the most suitable ewes, feeding the flock (a most important part of sheep husbandry that must not be neglected), and in attending to the ewes during the gestation period and at lambing time.

Should the farmer purchase ewes at the sale yards, he should be there early in order to have ample time to go through the different lines to be submitted. There may be several lines on offer not suitable to the particular class of country for which they are required. Many buyers of sheep do not examine the lots they are likely to purchase; more attention should be given to this.

There will always be sheep that require to be rejected from purchases made at sales. These sheep should be picked out and fattened as speedily as possible and sold for mutton. The flock will thus be made more uniform.

Before the flock of ewes is shorn, there is another opportunity for culling when they are carrying their full fleece. The ewe hoggets should be culled heavily, and any ewe about which there is any doubt should be rejected. It is upon the young ewes that the farmer is depending to build up his flock to be a credit to himself and the State.

Western Australia is fortunate in having many enthusiastic stud-breeders, and it is largely to the work of these men that the sheep industry owes its success.

Thousands of pounds have been spent in the purchase of the highest grade sheep for breeding purposes, and by skill and perseverance they have built up flocks of a high standard. From them the ordinary farmer can procure sheep from which, by careful selection and mating, he can breed up a high-grade flock or improve his existing one.

No heed should be taken of the low prices for wool or sheep—things will right themselves again after occasional set-backs and disappointments.

May we never lose enthusiasm in continuing to purchase and to breed from only the best sheep obtainable.

POTATO GROWING—CONSIDERATIONS OF SEED.

W. E. Collins,
Inspector of Potatoes.

Large and Small Seed.

In order to ascertain what size of seed will give the maximum net yield per acre under given conditions, many points must be considered. The conditions of cultivation are of primary importance; the climate in determining the duration of the growing period must have its effect; the health of the stock will have its influence, while the spacing of the sets in the furrow is also of considerable importance.

On the other hand it has been clearly established by workers in England, Germany and America, that the use of normal seed—those weighing about 2 ozs.—is amply justified, and that the planting of larger or smaller setts is called for only under special circumstances. Assuming the stock to be healthy, small setts do not give the plants such a good start as the larger ones, and there is no doubt that in times of drought large setts have a distinct advantage in that they provide a convenient source of water to the plants, water absorbed by the sett from the soil.

Recent experimental work in this direction, conducted in conjunction with the potato fertiliser trials at Benger Swamp and where drought conditions prevailed, demonstrated most markedly the above fact. Six plots each of setts weighing respectively 1 oz., 2 ozs. and 3 ozs., were planted and progress of growth noted. The plants from the 3 oz. setts were quite outstanding in size and vigour throughout the growing period, the 2 oz. setts less so, and the 1 oz. setts least of the three.

On digging, a corresponding difference in yield was tabulated—the 3 oz. setts yielding approximately 4½ tons per acre, the 2 oz. setts 3½ tons per acre, and the 1 oz. setts 2½ tons per acre.

The larger the sett the more stems there will be, and consequently the greater number of tubers set to each plant. However, if there are too many stems to a plant, and consequently too many tubers are set, few of them will reach "ware" size. Hence the objection to setts that are too large, aside from the greater cost.

It is important to know the most economical distance apart to plant the setts, so as to get the largest yields with the least amount of seed. The net average yield in experiments considered over a period of eight years in America, was greatest from the setts planted in rows 2½ feet apart with the setts 14 inches apart in the rows, though those planted 12 inches apart yielded nearly the same.

The results of five seasons' tests in England warrant the conclusions that planting at from 12 to 14 inches apart, and 30 inches between the rows, is likely to give better yields, and a more uniform grade of ware potatoes, than planting at wider distances.

The practice of the Potato Branch in their experimental work, is to plant 2 oz. setts 15 to 18 inches apart, and 30 inches between the rows. Over a period of three years an average yield of 7¾ tons per acre was noted.

It would seem that a safe general rule to follow in planting potatoes is to increase or decrease the distance between the rows, as well as the setts, in accordance with the size of the seed used, the fertility of the soil, the moisture holding capacity, and the average normal rainfall that may be expected when the plants are developing their tubers. The nearer the soil and weather conditions approach the ideal the larger the seed, i.e., up to 2 oz., and the closer the planting.

The weight of seed planted in the different potato growing areas of the State varies from 8 cwt. to 18 cwt. per acre, the average being 12 cwt.

In order to afford a ready reference to the actual quantity of seed required to plant an acre with setts of definite weights at a given distance between plants, a table has been prepared to cover setts ranging from one to two ounces in weight. It will be noted that plantings made at close intervals with setts ranging from 1¼ to 2 ozs. requires quantities of seed very greatly in excess of those ordinarily used. On land well supplied with organic matter, an abundant supply of available plant food, and moisture, the use of large setts from 1½ to 2 ozs. in weight will prove a profitable investment.

WEIGHTS OF SEED REQUIRED TO PLANT AN ACRE OF POTATOES AT DIFFERENT SPACINGS WITH SETTS OF VARYING WEIGHT.

Distance between Rows and Setts.	1oz. Setts.	1¼oz. Setts.	1½oz. Setts.	1¾oz. Setts.	2oz. Setts.
	T. C. Q. L.	T. C. Q. L.	T. C. Q. L.	T. C. Q. L.	T. C. Q. L.
ROWS 24IN. APART—					
12in. spacing	0 12 0 17	0 15 0 21	0 18 0 26	1 1 1 2	1 4 1 6
14in. spacing	0 10 1 7	0 12 3 16	0 15 1 25	0 18 0 7	1 0 2 14
16in. spacing	0 9 0 23	0 11 2 0	0 13 3 7	0 16 0 13	0 18 1 18
18in. spacing	0 8 0 12	0 10 0 15	0 12 0 18	0 14 0 21	0 16 0 24
ROWS 26IN. APART—					
12in. spacing	0 11 0 5	0 13 3 6	0 16 2 8	0 19 1 9	1 2 0 10
14in. spacing	0 9 1 14	0 11 2 24	0 14 0 7	0 16 7 17	0 18 3 0
16in. spacing	0 8 1 14	0 10 1 24	0 12 2 7	0 14 2 17	0 16 3 0
18in. spacing	0 7 1 13	0 9 0 23	0 11 0 5	0 12 3 15	0 14 2 26
ROWS 28IN. APART—					
12in spacing	0 10 1 7	0 12 3 16	0 15 1 25	0 18 0 7	1 0 2 14
14in. spacing	0 8 3 2	0 10 3 23	0 13 0 17	0 15 1 7	0 17 2 4
16in. spacing	0 7 3 7	0 9 3 2	0 11 2 25	0 13 2 20	0 15 2 14
18in. spacing	0 6 3 14	0 8 2 10	0 10 1 7	0 12 0 3	0 13 3 0
ROWS 30IN. APART—					
12in. spacing	0 9 2 8	0 11 3 24	0 14 1 12	0 16 3 0	0 19 0 16
14in. spacing	0 8 0 14	0 10 0 17	0 12 0 21	0 14 0 24	0 16 1 0
16in. spacing	0 7 1 0	0 8 4 7	0 10 3 14	0 12 2 21	0 14 2 0
18in. spacing	0 6 1 14	0 7 3 26	0 9 2 9	0 11 0 20	0 12 3 0

Cut and Whole Seed.

Whether the grower should plant whole or cut seed depends largely upon the conditions under which he is operating. There are planting months, viz., December and January, that make the use of whole seed almost necessary. Benger Swamp, for instance, planted during January, when temperatures

ranging from 90deg. to 106deg. often prevail, would readily destroy cut seed. Again, where moisture is deficient, cut seed will germinate very irregularly, since the moisture from the cut sett is taken out by the hot dry soil, thus destroying the seed. But where reasonably cool temperatures obtain, and there is sufficient moisture in the soil to enable the potato plant to get a good start, cut seed will be as satisfactory, or even more satisfactory than whole seed.

The chief objections to the planting of whole seed are—first, the number of undesirables that creep in, even where the grower is careful, and the tubers are from a good crop—undesirable inasmuch as they are from weakly plants and cannot be productive; secondly, whole seed potatoes are apt to produce a number of stems to the plant, and these compete among themselves for the available food supply and moisture. The result is a large number of small-sized potatoes, and the percentage of these from the area planted with whole seed is much higher than from that planted with cut seed. The ideal number of stems to a plant is from one to two.

Cut seed may be planted immediately after cutting, or it may be kept for several days. In the latter case our wet bag method, as outlined in previous issues of this Journal, should be adopted. Prolonged delay in planting after the seed has been cut, without this treatment, lowers the vitality of the seed and reduces the yield.

Experiments conducted by the Potato Branch over a period of three years, demonstrated the fact that the balance of yield in favour of treated seed was approximately 2 tons per acre. The "wet bag" treatment is quite simple, but apparently of great importance to potato growers. Numerous reports of the successful application of this method, which has been advocated by this Branch for some time, have been received. These reports all indicate that the "wet bag" treatment of seed or its modification in the case of greened sprouted seed, increases the subsequent crop.

As a preliminary the seed is emptied out of the bags, and the bags are then thoroughly soaked in water; cut the tubers (if unsprouted, as is general in South-West districts) into the bags, and then leave in a cool place for a period of 24 to 48 hours prior to planting, or until such time as it takes for the surface to callous over. To minimise the risk of injury to the sprouts, advanced or well sprouted seed should be cut into boxes, covering same with wetted bags. It will be found that a layer of suberin or corky material has formed over the cut tissues. This layer stops the leaching of cell sap from the cut surface, and also prevents the ingress of harmful soil bacteria or fungoid troubles into the sett.

Each cut sett must contain at least one eye. The value of such setts, however, would appear to be more dependent on their size than on the number of eyes they possess. An examination of some experiments made to determine the value of eyes taken from different parts of one healthy tuber reveals the fact that there exists no consistency in the results, hence it may be concluded that there is no particular portion of a healthy tuber which is more suited for seed purposes than the remainder.

Stem ends have always been regarded with suspicion by growers. They start to grow more slowly and very often produce weak and unproductive plants.

Differences in yield trials between crown and stem ends may be accounted for by the dominance of the crown sprouts. If the tubers be cut sufficiently early their dominance will be destroyed, equally strong sprouts will develop on each portion and the capacity for yielding on each will be similar. Again should the tubers be sprouted, removing the crown sprouts will induce the remaining eyes to bud almost immediately and with equal strength. Removal of sprouts, however, is undesirable and should be avoided.

The tubers should be cut so as to make "blocky" rather than wedged-shaped sets. The advantage of a "blocky" set is less likely to decay in the ground if the weather conditions are unfavourable, and it offers less cut surface to the damaging effect of fertilisers at the time of planting.

Mature and Immature Seed.

Many experiments have been conducted to test the relative values of what is called mature and immature seed. There is very little difference under average conditions as they obtain in our potato growing areas. Well matured, disease-free tubers, kept under proper conditions will make good seed and produce satisfactory yields.

Immature seed—that is, tubers that have not attained their full growth at digging time—will usually not keep well. Such tubers are subject to bruises, and the skin peels readily, thereby inviting the well known storage disease of "Black Spot" or storage trouble of potatoes. Adverse storage conditions are more apt to injure such seed than seed that is ripe. Further, the question of maturity is only a relative one. It is said that a tuber is ripe when the skin adheres closely and does not peel in handling. A tuber assumes this character when growth is checked by an attack of Early Blight (the cause of "Storage Trouble"), or as in the case of our summer plantings when early winter rains set in and arrests the natural maturing of the crop, in consequence a premature ripening is the result in both instances. One advantage of using immature seed is its comparative freedom from disease, due to the fact that a crop so dug is not exposed so long to disease infection as is one allowed to ripen completely, but mature seed is only less productive when diseases are prevalent. This applies even more strongly in the case of degenerate troubles such as Mosaic, Leaf Roll, etc. Certified seed is more or less an answer, these tubers being selected from fully ripened and matured crops.

PERTINENT TOPICS.

Geo. L. Sutton,
Director of Agriculture.

PORKERS AND BACONERS.

Pig raising is obviously allied to dairy farming, because of the skim milk produced as a by-product during the operations of the latter and its profitable utilisation by the pig. Despite this, the raising of pigs has not progressed in this State as rapidly as could be expected, having regard to the increase in the number of our dairy cattle. As the fundamental method of bringing about an improvement in this direction it was considered essential that a definite plan to produce the most suitable carcase for pork and for bacon should be decided upon and recommended to farmers.

So that the plan could be accepted not only by Departmental Officers, but by others interested in this matter, it was decided to have a conference with representatives of the Royal Agricultural Society, as representing the agriculturists, and also with those interested in the bacon industry. The result of the Conference has been fully reported by the Superintendent of Dairying (Mr. G. K. Baron-Hay) in the last issue of this Journal.

Summed up, it was unanimously agreed, and quite recently (21-5-30) approved by the Royal Agricultural Society, that the requirements for both the pork and bacon trade could best be met by the Berkshire-Tamworth comeback, and that no single pure breed quite met requirements as well as this double cross. The breeding of this ideal baconer involves two stages instead of one, as would be the case if one pure breed had been suitable for the purpose. This slight difficulty can be readily overcome if each stage is made the work of separate farmers, viz., some who make it their business to raise the first cross of Berkshire-Tamworth or Tamworth-Berkshire in order to produce the dams of the second cross, and other farmers whose business it will be to purchase and mate these first cross-bred dams with a pure Berkshire boar to produce the second cross porkers and baconers.

Already some farmers are producing the Berkshire-Tamworth cross sows, and, as part of the Departmental policy in connection with stimulating pig raising, and to give effect to the decisions agreed upon at the Conference, it is recommended that this plan become more general, and that a number of farmers make a speciality of raising Berkshire x Tamworth or Tamworth x Berkshire sows for sale to those intending to sell porkers or baconers, and who will mate these cross-bred sows with a pure bred Berkshire boar.

Those whose intention it is to carry out the first stage and breed Berkshire-Tamworth or Tamworth-Berkshire sows are requested to forward their names to this Department. This request is made so that those who propose to carry out the second and final stage of breeding porkers or baconers may be advised where they can purchase the dams they need.

A CONVENIENT METHOD OF DISTRIBUTING "OATS" TO SHEEP.

The illustration herewith shows an adapted harvester box attached to a Ford car, and was used by Mr. J. Deane Hammond, of "Cuttening," Kellerberrin, during the past season for feeding "oats" to his sheep in the summer. The adapted box is twelve inches wide, made with a wooden back to which are attached two ⅜in. iron stays to hold the sides taut; it holds 1½ bags—180 lbs. This weight is considered sufficient, as the box itself weighs a considerable amount, and is supported on the running board, to which it is attached by two cultivator bolts. The box is also attached to the side at each end by iron straps. The oats are allowed to trickle on hard ground as the car is moving, the rate of flow through the door is regulated by the lever-handle, which is close to the right hand

Attachment to Car for feeding oats to Sheep.

of the driver. The sheep pick up the grain without waste, and as they run after the car obtain that exercise which they fail to obtain when fed at stationary feeders. This method has the advantage in that it prevents "crowding," and thus affords an equal opportunity to all the sheep to secure their ration. With lambing ewes it has the special merit that it minimises the risk of loss from fatty infiltration of the liver on account of the exercise they are compelled to take when following the car track to secure the oats.

TRIAL WITH LUCERNE SEED FROM THE ARGENTINE.

In March, 1929, a small quantity of "Santa Fe" lucerne seed from the Argentine was supplied to the Department of Agriculture by Mr. C. L. K. Foot, of Subiaco, for trial in this State.

With the object of ascertaining its suitability in different parts of Western Australia the seed was distributed to several of the Experiment Farms in the Wheat Belt under the control of the Department, and to settlers in the South-West portion of the State.

Reports received in connection with the growth of this variety indicate that, compared with the "Hunter River" variety from New South Wales Hunter River Valley, it is not as suitable for our conditions as the latter, which was taller and made decidedly better growth.

These results indicate that the "Santa Fe" variety of lucerne is not to be preferred to the New South Wales variety, and no advantage will be gained by cultivating it in this State.

IS THE TOMATO A FRUIT OR A VEGETABLE?

Recently my opinion was asked upon the above question. I am including my views in these notes as I have since learnt that the matter is likely to be of considerable general interest.

Botanically, any part of a plant which contains the seeds is a fruit, irrespective of the use it may be put to. In a strict botanical sense, the tomato then, is a fruit.

If, however, the botanical definition be accepted as being the one for ordinary everyday use by the average person, then similarly pumpkins and French beans must be called fruits, for botanically this is what they are. To call them "fruits" would, however, be ridiculous, for to do so would be entirely opposed to the generally accepted common practice. One would look with amazement in a fruiterer's window at a lot of pumpkins—however tastefully displayed—if they were amongst, say, peaches and grapes, and marked fruit.

It seems, therefore, that the most reasonable way to approach this question "Is the Tomato a fruit or a vegetable?" is to have regard to the household or commercial meaning of these two terms. Having regard to this viewpoint, it is suggested that by vegetable is understood a plant, or part of a plant, which at a meal is usually served either cooked or as a salad, with the meat, and fruit is that part of a plant which is served as dessert.

From inquiries which have been made it would appear that the Tomato is not generally, if ever, used as dessert, either in Australia or in Britain. Under these circumstances the conclusion has been arrived at that in the household or commercial sense the Tomato is to be regarded as a vegetable.

PRESENT COMPARATIVE VALUE OF FEEDING STUFFS.

G. K. BARON-HAY,
Superintendent of Dairying.

During the last few months the writer has received numerous inquiries regarding the comparative value of various foodstuffs on the market. These have no doubt been prompted by the high prices ruling for bran and pollard since the beginning of the year, the latter being almost prohibitive.

There is no doubt that in normal seasons and under normal trade conditions the ruling prices for foodstuffs do approximate to their relative feeding values. Where for some reason, however, the market becomes disorganised, the current market price of a foodstuff may be out of all proportion to its feeding value.

The following notes therefore have been prepared to assist farmers in selecting those foods likely to give the most economical returns when fed to stock.

The values are based on the average prices ruling in Perth during May, 1930, for the respective foodstuffs.

TABLE I.

Showing Nutritive Ratio, Starch Equivalent, Price per unit Starch Equivalent, and Price per Pound Starch Equivalent.

—	Nutritive Ratio. 1:	Production Starch Equivalent.	Market Price.	Price per Unit S.E.	Price per lb. S.E.	Digest. Proteins.
		%	£ s. d.	s. d.	d.	%
Concentrates—						
Meat Meal	0·4	90	17 10 0 per ton	4 4¼	2·33	72·3
Skim Milk	1·5	8·8	0 0 1½ „ gall.	3 9½	2·03	3·6
Butter Milk ...	1·5	8·2	0 0 1½ „ „	3 10½	2·08	3·4
Cotton Seed Cake ...	1·8	74	15 10 0 „ ton	4 8½	2·52	27·7
Linseed Meal ...	2·2	79	16 10 0 „ „	4 8	2·50	26·0
Field Peas	3·0	73	0 9 0 „ bush.	4 7¼	2·46	19·0
Grain and Grain Products—						
Wheat Bran ...	4·5	45	8 10 0 „ ton	4 2¾	2·26	10·6
Wheat Pollard ...	4·2	53	9 10 0 „ „	4 0	2·14	13·4
Oats	7·9	60	0 2 2 „ bush.	2 3½	1·21	8·0
Barley	7·8	73	0 3 4 „ „	1 10½	0·91	9·0
Wheat	7·5	72	0 4 10 „ „	2 6¾	1·37	10·2
Hay or Chaff—						
Oaten	10·2	35	4 7 6 „ ton	2 6	1·34	5·6
Wheaten	9·0	35	4 17 6 „ „	2 9	1·47	4·0
Subterranean Clover Hay, Prime	3·9	31	4 0 0 „ „	2 8	1·43	11·8
Potatoes, Small ...	14·5	17	2 0 0 „ „	2 4	1·25	1·1

In buying feeding stuffs it is extremely difficult to form an exact estimate of the relative money values of those feeds by a consideration of their price per ton. Before therefore passing to a study of the results of the figures shown in the table, it will be necessary to understand exactly what these figures convey, and how far they may be relied upon when purchasing foodstuffs.

All foodstuffs may be split up by chemical analysis into the following constituents:—

1. Moisture. 2. Dry Matter.

A. Ash or Mineral Matter. B. Organic Matter.

i. Crude Proteins. ii. Fats. iii. Carbohydrates. iv. Fibre.

In calculating the values of foodstuffs the organic portion contains the important constituents, and under the present system of valuation determines the comparative feeding value of any food.

Crude Proteins.—This class of substances represents the organic matter containing nitrogen, and may be considered as essentially the flesh-forming material of any foodstuff.

Fats.—The fats of foodstuffs are essentially the energy and heat producing constituents, but besides supplying heat or energy they assist in building up the body fat in animals. Fats do not contain any nitrogen and cannot therefore replace proteins in the ration of animals.

Carbohydrates consist principally of sugars and starches, which chemically contain the same substances as fats, but in different proportions, so that on burning they produce less than half the energy or heat than the fats do, and are therefore not so valuable as fats. These substances cannot replace proteins in the ration as they do not contain any nitrogen.

Fibre.—Fibre consists largely of the cell envelopes of plants and is the least digestible portion of the foodstuff. A high percentage of fibre in a food therefore can generally be taken as an indication that it is low in feeding value. Fibre, if digested, performs similar functions as do the carbohydrates and are often grouped with digestible carbohydrates.

Nutritive Ratio.—As neither fibre, carbohydrates nor fats can replace protein in a food, the relative proportion of nitrogen-bearing constituents or proteins to the non-nitrogen-bearing constituents should always be borne in mind. The proportion of flesh-formers to fuel and fat is called the "nutritive ratio," and is shown in Column I. The more nitrogen a food contains the lower will the figure for the nutritive ratio be, and the food is referred to as having a narrow ratio if the ratio approximates 1:4.0. For instance, in the case of wheat bran, each one pound of protein or flesh-former is combined with 4.5 pounds of carbohydrates and fat.

Production Starch Equivalent.—For the purpose of comparing the value of one food with another, chemists have sought to reduce everything digestible to one common factor so that foods may be compared directly with one another.

For the purposes of this article the comparison of foods has been based on their Production Starch Equivalents, that is by comparing figures representing that amount of pure starch which would produce the same amount of fat when eaten by an animal as 100 lbs. of the feeding stuffs being compared. This figure is the most accurate method of comparing feed stuffs, as it is based on the digestible nutrients only, and by experiments carried out with animals, makes an allowance for the work done in digesting the food. The starch equivalent is therefore low in the case of very fibrous foods.

Although this valuation does not denote all the properties of any food, a farmer may feel quite safe in allowing himself to be guided by these figures, provided attention is paid to the following factors, which affect their practical worth.

Wholesomeness.—It is a matter of experience that stock thrive better on certain foods in contrast to other foods supplying similar nutriment by analysis. In Table I. the value for a unit of starch equivalent in oats is 2/3¼ as compared with 2/6¾ in wheat. The difference in the nutritive ratio is very slight, and so that unless experience shows that oats are in some way detrimental to the animal to be fed, and wheat is more wholesome, then certainly oats should be bought in preference to wheat on the score of cheapness.

Palateableness.—Stock exhibit preference for certain foods, but this should not be allowed to become too costly. Palatability can often be improved by the addition of condiments, such as salt or molasses, or by mixing.

Change of Feeding Stuffs.—All feeders who have had occasion to change the foods fed to stock have noticed that at first stock do not "take to" the new ration, and in some cases, therefore, the new ration is not viewed favourably. This is often the case when starting to feed silage. Changes in foods should always be gradual, especially if the nutritive ratio in the foods to be substituted vary greatly.

Appearance.—No doubt appearance is often paid for by feeders. Recently some bran selling on the local market has had quite a dark colour and appeared coarser than the bran to which local feeders had been accustomed. When examined by the Department, however, this bran conformed to the standards required under the Feeding Stuffs Act equally as well as more attractive samples.

In perusing Table I. it will be seen that the three cheapest stock foods at present on the market for the production of work are:—

Price per lb. Starch Equivalent.

	pence.
Barley	0·91
Oats	1·21
Wheat	1·37

whereas bran and pollard are amongst the dearest foods at present prices, with values per lb of starch equivalent as follows:—

	pence.
Pollard	2·14
Bran	2·26

Barley, though eminently suitable for feeding to either cows or pigs, is not available in unlimited quantities. This, however, does not apply to wheat or oats.

Wheat is a suitable feed in large quantities for pigs or poultry, but is dangerous when fed to horses or cattle in large amounts. In the ration for dairy cows it should not exceed a quarter of the total grain fed. By commencing with a small quantity horses may gradually become accustomed to eating up to 9 lbs. daily without injury, but this quantity should be fed with considerable caution.

Crushed wheat may be used to replace pollard for feeding to pigs, and will effect a considerable saving in the feed bill, as is shown below:—

TABLE II.

	Protein.	Starch Equivalent.	Cost.
	%		
Wheat ... ... 100 lbs.	10·2	72	8·05s.
Pollard ... ... 100 „	13·4	53	9·50s.
Saving on 100 lbs.	...	...	1·45s.
Saving on Short Ton	...	...	£1 9s. 0d.

Where skim milk is available on the farm, the saving effected by substituting crushed wheat for pollard is as shown in Table 2 above, namely, £1 9s. per short ton, no other concentrate being required where skim milk is available.

It will be noticed that the nutritive ratio of wheat, i.e., 1 : 7.5, is wider than that of pollard, i.e., 1 : 4.2. This should be borne in mind when feeding wheat in place of pollard, as disappointing results may be obtained unless this wide figure for wheat is not remedied by the addition of some highly concentrated food. For this purpose, meatmeal, cotton seed cake, linseed cake or peas are all suitable. At present prices, however, it will be found that these mixtures, while approximating in composition and feeding value to pollard, do not effect a great saving in the feed bill owing to the relatively high prices of these concentrates. When, however, the prices are satisfactory, meatmeal may be added to wheat in the proportion of 1 part to not less than 10 parts wheat, and the other foods mentioned should be mixed in the proportion of 1 part to 4 parts wheat.

Oats.—None of the objections raised above when dealing with wheat for feeding to stock, particularly cows or horses, apply to oats. No other cereal is as safe, as satisfactory, or as well calculated to maintain condition and health as is oats. For a daily ration for cattle, oats can well replace bran at present prices. When crushed oats are used to replace bran in feeding cattle, a considerable saving in the feed bill may be expected, as is shown in Table 4.

In Table I. it will be noticed that oats have a nutritive ratio of 1 : 7.9, whereas bran has a narrower ratio of 1 . 4.5. In other words, bran is a more concentrated supplier of protein or flesh-forming food than is oats. This is important where oats has to be fed to cows for the production of milk, as milk is a highly nitrogenous substance.

Where subterranean clover hay, however, is available a very cheap ration may be compounded, using 4lbs. subterranean clover hay to every 1lb. of oats fed in addition to any cereal hay or pasture that stock may be receiving. The saving amounts to as much as £4 10s. 9d. per ton where subterranean clover hay is valued at £4 per ton. (See Table III.)

TABLE III.

——	Protein.	Starch Equivalent.	Cost.
Subterranean Clover ... ... 400 lbs.	47·2	124	14·29s.
Oats ... ... 100 „	8·0	60	5·50s.
500 „	55·2	184	19·79s.
Therefore, Mixture ... ... 100 „	11·04	46	3·96s.
Bran ... ... 100 „	10·6	45	8·50s.
Savings on 100lbs. of Mixture	...	...	4·54s.
Saving on Short Ton	...	...	£4 10s. 9d.

CENTENARY PRODUCTION CERTIFICATES FOR WHEAT.

I. THOMAS,
Superintendent of Wheat Farms.

The centenary production certificates for wheat were limited to those farmers who harvested at least 200 acres of wheat for grass during 1929, the Centenary Year. The yield, which was from the total area harvested, was determined by agents' dockets plus the amount reserved for farm requirements.

Three certificates were available, viz., an Award of Merit to those farmers whose crops, grown last year, averaged at least 15 bushels per acre; an Award of Distinction to those whose crops averaged 18 bushels, and to those farmers whose crops averaged over 21 bushels, an Award of Special Distinction. A medal is accompanying each certificate.

The following is the list of farmers to whom the certificates have been awarded:—

Awards of Special Distinction—Over 21 bushels per acre:—

Competitor.	Address.	Acreage.	Yield per Acre.	
			bus.	lbs.
McDonald, J.	"Springvale," Gnowangerup	279	36	41/60
Willard & Willard ...	Gnowangerup	249	30	20/60
Formby, R. & Co., Ltd. ...	Gnowangerup	227	29	18/60
Lahoar, W.	Gnowangerup	292	28	41/60
Eckermann, H. W. ...	Yandanooka	257	28	4/60
Saunders, W. S.	Yandanooka	241	27	57/60
Booroondara Grazing Co., Ltd.	Toompup	216	27	46/60
Richards, T.	South Caroling	380	27	21/60
Mouritz, E. A.	Gnowangerup...	200	26	31/60
Moir, C. C.	Borden	220	26	15/60
Moore, Tom	Indarra	300	26	11/60
Stone, J. D.	Borden	584	26	3/60
Bastian, A.	Three Springs	333	25	30/60
Murray, W. W.	"Glen Yurret," Borden ...	423	25	28/60
Carter, R. & Son	Three Springs	277	25	16/60
Troy, M. F.	Indarra	364	25	22/60
Chambers, E.	Pallinup	280	24	49/60
Quartermaine, R.	Yandanooka	229	24	31/60
Brown, J. A.	"Raith," Yandanooka ...	270	24	28/60
Rudduck, A.	"El Cala," Coorow ...	860	24	19/60
Nottage, R. B.	Tammin	249	24	13/60
Darby, A. H.	Lake Grace	200	24	1/60
Hammond, J. Deane ...	"Cuttening," Kellerberrin ...	300	23	32/60
Smith, H. R.	Yandanooka	545	23	25/60
Wilson, A. F.	"Fairview Farm," Dumbleyung	550	23	3/60
Johnston, A.	"Wendouree," Gnowangerup	520	22	50/60
Stone, S. G.	Borden	231	22	25/60
Clark, R. W.	"Rosebury," Carnamah ...	750	22	14/60
White, W. T.	"Rosedale," Winchester ...	360	22	8/60
Browning, H.	Yandanooka	222	21	54/60
Thomas, C. F. & Sons ...	Three Springs	526	21	53/60
Mott, C.	Moulyinning	249	21	17/60

Award of Distinction.—Over 18 and under 21 bushels per acre :—

Competitor.	Address.	Acreage.	Yield per Acre. bus.	lbs.
Mott, H.	"Redhill," Moulyinning ...	222	20	48/60
Cardwell, C. H.	Noman's Lake	223	20	47/60
Green Bros.	"Bushy Park Farm," Carnamah	640	20	38/60
Smith, C. & Sons	Bruce Rock	2,765	20	36/60
Hocking, H. R.	"Quondong," Tammin ...	392	20	31/60
Coad, S.	"Killarney Farm," Nippering	260	20	30/60
Morrell Bros.	"The Ironbarks," Greenough	262	20	26/60
Cousins, A. H.	Arrino	700	20	17/60
Bishop, H. F.	"Oruba," Lake Grace ...	212	20	8/60
Braysher, F. E.	Kellerberrin	487	19	42/60
Prowse, E. W.	".Omagh," Doodlakine ...	453	19	3/60
Hornsby & Son	"Denewood," Moulyinning...	344	18	54/60
Jackson, H. E.	"Koo-lyn," Bruce Rock ...	285	18	49/60
Crawford, A. H.	"Milroy," Brookton ...	290	18	46/60
Mackin, C. C.	Tammin	558	18	44/60
Strutton, A. R.	"Narrayarra," Three Springs	546	18	43/60
Ellis, M. P. & E. G. ...	Bruce Rock	296	18	42/60
Lucas, F.	"Floradale," Carnamah ...	385	18	40/60
Garrett, G.	Bruce Rock	697	18	37/60
Merredin Experimental Farm	Merredin	335	18	32/60
Ward, H. F.	"Mt. Rest Farm," Dumbleyung	218	18	29/60
O'Grady, L.	Pantapin	390	18	23/60
Nichols, R.	Kulin	751	18	12/60
Murray, A.	"Quonyonbing," Tinkurrin...	415	18	9/60
Clark, A. & J.	Kellerberrin	688	18	2/60
Downie, J. C. & G. ...	"Milldowns," Trayning ...	550	18	0/60

Awards of Merit.—Over 15 and under 18 bushels per acre. :—

Uppill, G.	Tammin	902	17	55/60
Johnston, H. C.	Kulin	723	17	54/60
Trotter, A. W.	"Barbabilling Farm," Kulin	464	17	52/60
Woodburne, J.	Lake Grace	281	17	50/60
Carwardine, F. J.	"Grassdale," Moulyinning ...	335	17	49/60
Henderson, J. H.	Kulin	483	17	45/60
Dinnie Bros.	"Cambrae," Buntine ...	1,250	17	43/80
Vaux, J. & S. F.	"Wigboro," Ongerup ...	450	17	43/60
Inzard, A.	Ogilvie	927	17	40/60
Mann, J. W.	Yorkrakine, *via* Tammin ...	609	17	40/60
Folland, S. L.	"Enfield Park," Waddy Forest	590	17	37/60
Stacey, J. & Son	"Sunnyvale," Quairading ...	2,000	17	35/60
Jenkins, R. M.	Corrigin	586	17	34/60
Langsford, E. W.	"Mt. Pleasant," Quairading	750	17	31/60
Morrell Bros.	"Mt. Rennie," *via* Geraldton	365	17	26/60
Bowron, L.	"Rockwell," Corrigin ...	450	17	20/60
Locke, J. A.	"Romani," Pithara ...	540	17	19/60
Smith, C. & A. H. ...	"Sunnyside Farm," Bruce Rock	1,340	17	17/60
Harris, R. W.	Dalwallinu	1,040	17	16/60
Crossland, J. L.	Corrigin	990	17	13/60
Prowse Bros.	"Wallatin," Doodlakine ...	1,349	17	12/60
Tayler Bros.	Yuna	1,080	17	10/60
Michael, L. G.	Roundhill	302	17	8/60
Forrester, J. K.	"Dunester," Carnamah ...	1,500	17	1/60
Sutherland, L. & S. ...	"Wamballa," Pithara ...	550	17	1/60
Bushell, J. C.	"Trelawney," Watheroo ...	450	17	0/60
Cook, W. T.	Burracoppin	400	16	44/60
Cusbert, L. C.	Bruce Rock	559	16	38/60

Awards of Merit—Over 15 and under 18 bushels per acre—*continued* :—

Competitor.	Address.	Acreage.	Yield per Acre.
			bus. lbs.
Prowse, A. E. C.	"Kogarrara," Doodlakine ...	425	16 35/60
Nicholls, H.	"Trelawny," Kellerberrin ...	218	16 34/60
Atkinson, A. G.	Ogilvie	597	16 29/60
Cripps Bros.	Ogilvie	600	16 23/60
Dwyer, J.	"Ularing," Southern Brook	590	16 23/60
Barr, D. F.	"Glenlaurall," Shackleton ...	610	16 21/60
Horsman, H. & Son ...	Corrigin	561	16 20/60
Rendavey, H. R.	Jibberding	500	16 16/60
Gard, T.	"Wattle Grove," Kukerin ...	320	16 3/60
Gibbs, R. T.	Kellerberrin	352	16 2/60
Hughes Bros.	"Strathmore," Minnivale ...	360	16 1/60
Strange, P. A.	"Cotswold," Yarding ...	440	16 0/60
Park, C. H..	Korraling	900	15 56/60
Richardson, E.	"Jam Creek," Broomehill ...	340	15 49/60
Faulkner, W. J.	"Kukerin Soak," Kukerin ...	372	15 47/60
Gamble, R. A.	"Lyndhurst Farm," Kondinin	500	15 47/60
Bahr, E. O.	Kukerin	337	15 46/60
Dring, C. W.	"Lindum," Carnamah ...	955	15 45/60
Dring, G.	"Lindum," Carnamah ...	955	15 45/60
Allen, E. V. D.	"Lindum," Carnamah ...	955	15 45/60
Jackson, E. W.	Narembeen	380	15 40/60
Blatch, B. G.	Dulbelling, *via* York ...	260	15 40/60
Dunwell, P.	Yealering	230	15 39/60
Orr, R.	"Linwood," Newdegate ...	925	15 36/60
Fulwood, C.	Corrigin	352	15 34/60
Bolton, L. B.	"Burlington," Namban Siding	630	15 24/60
Muntz & Son, J. N. ...	Bruce Rock	379	15 24/60
Jewell, J. D.	Corrigin	602	15 15/60
Dumsday, L.	"Talgomine Downs," Goomarin	412	15 13/60
Charsley, A. J.	"Nampup," Nyabing ...	550	15 12/60
Lee & Sons	"Jandarra," Trayning ...	800	15 11/60
Baxter, C. J.	"Doolwa," Doodlakine ...	460	15 1/60

THE WILD TURNIP.

(*Brassica Tournefortii*, Gouan.)

A PRELIMINARY NOTE.

C. A. Gardner,
Government Botanist.

The Wild Turnip is proving to be one of the most serious, if not actually the most serious, of all the weeds with which the wheat farmer in Western Australia has to contend. Like many other obnoxious plants it came here unnoticed, gradually gaining ground and increasing in aggressiveness, until to-day it has spread to an alarming extent, and is still spreading.

This weed appears to have been introduced into Western Australia from abroad about the year 1913, the centre from which it has spread being not far removed from Hine's Hill or Nangeenan. Due probably to its superficial resemblance to Wild Radish (*Raphanus raphanistrum*), the weed was not regarded very seriously, and it was not until 1927 that it came under the notice of the Department of Agriculture. Now it has gained a firm footing in the districts lying between Southern Cross, Doodlakine, Belka, and Kununoppin, and unless immediate steps are taken by farmers, will undoubtedly cause serious losses.

The fact that Wild Turnip is not known to occur in any other State of Australia would indicate that it reached our shores either as a seed impurity, or amongst straw packing, which has accounted for the introduction of so many undesirable plants. Had the weed been promptly recognised and reported, its control would have been a relatively simple matter: to-day it has become so widespread that its eradication must be an undertaking requiring much patience and several years to fulfil.

Although so common in many districts, there are farmers who confuse this weed with Wild Radish, Mustard, and, in the young state with Cape Weed. The notes on its habit of growth, therefore, may be found of some use. They are not as complete as could be desired, but the writer has not yet seen the living adult plant.

Wild Turnip appears after the first winter rains. The two first leaves (seed-leaves) are heart-shaped, and are succeeded by small hairy toothed leaves one to two inches in length. Figure B illustrates this. The normal

leaves (see Fig. A) are long and narrow and much divided, the divisions reaching to the midrib. The leaf is a rich green in colour and sprinkled with short white hairs, the underside being of a paler green. The terminal lobe of the leaf is the largest, and the lateral lobes decrease in size downwards, until the lowest lobes are represented by small wing-like teeth. The veins are fairly conspicuous, and the midrib broad and whitish. These adult leaves lie upon the surface of the soil in a mat-like rosette radiating in all directions, only the youngest inner leaves being at all erect. The subterranean parts consist of a thick whitish taproot and strong lateral roots. From the basal rosette of leaves arise one or more stems apparently bare of foliage and erect and stiff. These stems branch repeatedly upwards (as illustrated) until a broad summit of twiggy branches is formed. The flowers arise singly from these ultimate branches on slender stalks. They are almost identical with those of Mustard, and yellow in colour, but larger.

The flowers in turn are succeeded by long and narrow green pods which contain two longitudinal cavities separated by a transparent membrane. Each cavity opens outwards by two lids or valves which open from the base upwards. The upper quarter of the pod is separated from the rest of the pod by a slight constriction, and contains one or two seeds which are never shed since the valves do not extend to this height. This portion is known as the "beak," and is pointed. Figures D. E and F illustrate this "beak." The beak is of considerable importance in the spread of the weed.

As the seeds ripen, the branches of the plant turn inwards at the summit after the manner of a burned wattle, and the stem breaks away at the base. The outline of the leafless part of the plant is now somewhat spherical, and the plant being light in weight is easily rolled along the bare soil by the wind. The ripened pods open and shed their seeds as the plant rolls along. Summer whirlwinds will often lift the plants over fences and similar obstacles, but scrub country offers an effective barrier. After the plant finally comes to rest it will probably have opened all its pods and shed its seeds during transit. There remain the beak seeds, which are never liberated. These in time break off with the persistent part of the pod, and are ready to germinate with the next winter rains. It will be seen, therefore, that the Wild Turnip is wonderfully equipped for effective seed dispersal. In addition to its own devices the plant is distasteful to stock with the exception of pigs, so that when once grown to maturity one plant may be responsible for several hundreds in the following year. It is not known for how long the seeds remain in the soil in a viable condition, but it is probable that, like the Wild Radish, they retain their viability for several years.

DISTINCTIONS FROM ALLIED PLANTS.

In the young state it is said that the Wild Turnip is often confused with Cape Weed. The similarity rests entirely upon the rosette-like growth of young leaves and their mode of division. The Cape Weed, however, has a fibrous root system and not a tap-root, and the leaves are distinctly whitish underneath. In addition the leaf-lobes are not so much incised, and the plant has no turnip flavour—a flavour very pronounced in the case of the Wild Turnip.

The Wild Radish (*Raphanus raphanistrum*) is in some respects similar, but the stems are leafy, and the leaves not so much divided, and the basal leaves do not as a rule lie in a flat rosette like those of the Wild Turnip.

EXPLANATION OF PLATE.

A. Leaf (half natural size). B. Young plant, showing primary and secondary leaves. C. Illustrating part of an inflorescence, and the general habit of the summit of the plant when in seed. D. Siliqua viewed from the side showing the beak and dorsal nerve of one valve. E. Section showing a siliqua with one valve removed and the seeds in position. F. View showing the ripe siliqua with the valves removed, the central partition with some of the seeds in situ, and the persistent beak. (Icon. origin.)

The flowers of Wild Radish are either white, yellow or pale pink-purple, and have violet veins. The seed-pod does not open vertically with two valves, but the pod is constricted between the seeds, and ultimately breaks up into one-seeded portions at these constrictions. The seeds are larger than those of the Wild Turnip.

The so-called "Mustard" (*Sisymbrium officinale*) has very different and smaller leaves, and the pods are much longer and narrower, beakless, and contain many more seeds than those of the Wild Turnip. The seeds are also much smaller.

The Wild Turnip is most prevalent around Hine's Hill and Nangeenan. It occurs to the south at Belka where it is also common, and it is found also near Bruce Rock. Eastwards it spreads to near Southern Cross, and its western limits at present are not far removed from Kellerberrin. It is also found in the Salmon Gums district between Scaddan and Bete, and is apparently most common near Dowak. Most probably it has been introduced into the Mallee Areas through chaff purchased from the Eastern Districts.

CONTROL.

In controlling the Wild Turnip it is important to restrict the weed to the area already occupied by it as a preliminary measure. It should be remembered that the plant is an annual, and the prevention of seeding is one method of control.

Late seeding of the crop, after the weeds have appeared and been cultivated, is one method to be employed. If good and early winter rains could be relied upon, the difficulty of eradication would be comparatively simple, but in many seasons the rains do not commence until late, and this does not allow of effective killing by cultivation after growth of the weed. In such cases it would be necessary to remove by hand any weeds which appeared in the crop.

Fallowing is the most radical method of treating the weed, keeping the fallow quite clean by repeated cultivation. Where the weed is well established it may be necessary to resort to fallowing for two years in succession, especially if no early seasonal rain falls. This system would allow of one entire season for germination, and permit also of the soil being cultivated the second winter before planting. Care should be taken, however, to see that all adjacent land is kept free from seeding Wild Turnips, otherwise the fallowing work would be wasted since seeds from adjacent areas may be blown on to the fallowed land.

Wild Turnip occurring on roadsides must be regarded as a menace to adjoining farms, and it is important that roadsides should be kept clear of the weed. Grazing land affected by the weed presents a problem, since stock do not eat it. Hoeing and hand pulling must be resorted to in such cases, unless the weed can be kept mown down. A scythe should be found effective provided the plants are not too old, when they become very tough.

Badly affected crops in which the weed has been allowed to grow should have stubble fires run through them as soon as circumstances permit after harvesting.

Other means of keeping the weed out of paddocks are:—Avoid purchasing chaff from areas in which the weed is known to occur. Do not borrow agricultural machinery, especially harvesters which may harbour some of the weed seeds, from neighbours who have affected crops. Do not destroy windbreaks which may be in existence, and encourage the growth of scrub around paddocks. Grade all seed wheat.

Pigs may help in keeping small areas in check, since they appear to be rather fond of the young plants.

DESCRIPTION OF PLANT.

An annual attaining a height of three to five feet. Primary (cotyledonary) leaves broadly obcordate, long-petiolate, abrupt at the base, emarginate and conspicuously net-veined, the primary and secondary nerves anastomosing. Secondary leaves petiolate, lyrate-pinnatifid, sinuately lobed, the lowest lobes divided to the midrib, coarsely hairy as well as the petiole with short stiff, acute hairs.

Leaves chiefly or almost entirely radical, spreading in a broad rosette in the young plants, deeply pinnatifid, the lateral lobes broadly oblong, irregular, broad at the base, crenate, the terminal lobe the largest, the whole leaf as well as the petiole setose with stiff short hairs which are more numerous on the petiole than on the leaf-blade.

Stems erect and rigid, much branched upwards, the branches spreading when the plant is in flower, but becoming incurved at the fruiting stage. Racemes stiff, spreading-erect. Pedicels more or less erect, rather thick. Sepals brown-purple, oblong, obtuse, with often a terminal bristle, and occasionally a dorsal thick-based hair in the upper half of the sepal. Petals yellow, obovate-attenuate, long-clawed, narrowed into the claw. Anthers erect on slender filaments. Ovary linear, truncate.

Siliqua (pod) linear-tetragonal, the valves keeled with a prominent dorsal nerve and a few irregular secondary nerves; beak long-conical, about as broad as the pod at the base, tapering into a long acute point and usually two-seeded. Seeds purple-brown, spherical and minutely pitted

Original home: Spain, the Mediterranean region, the Orient, and Beluchistan.

POTATO FERTILISER TRIALS AT BUREKUP, 1929.

J. C. PALMER, Dip. Agric.

Potato fertiliser trials were again carried out at Burekup in the winter cropping. These trials were a continuation of a series of experiments which have been conducted in this locality for the last few years. The trials were planted on land which formed part of the property of Mr. C. L. Clarke.

The land selected for the trials might be regarded as more or less typical of the soil of the potato-growing areas of that locality. Portion of the experimental area was a heavy clay and some was a sandy loam. Each variation of manure was repeated six times and set out on the Latin Square system.

Certified seed obtained from Mr. F. Tonkin of the Young's Siding area was used. This seed was racked for some weeks so that it might be greened and hardened up, then dipped in the cold corrosive sublimate dip (4 oz. of sublimate to 30 gallons of water) for two hours. Forty-eight hours prior to planting the seed was cut into 2-oz. setts and the cut setts treated according to the "wet-bag" method.

Planting took place on 17th July. The setts were carefully placed at a height of about three inches from the bottom of the furrow and four inches from the surface. The first cultivation was given on 9th September, and this was followed by cultivation and hoeing all through the growing period, so that a good tilth was maintained in the growing crop.

During the earlier portion of the growing period the weather was cold and wet. Heavy rain fell periodically, but the weather towards the end was generally suitable. The crop was sprayed with a commercial preparation of Bordeux Mixture at the rate of 2 lbs. per 15 gallons, as a preventive measure against Irish Blight, on 22nd October. The crop was dug on 25th November.

The sulphate of ammonia was applied in two dressings, half of it at the time of planting, and the remainder as a side dressing on 31st August, when the plants were showing up well in the rows. With this exception all the manure was applied in the furrow at the time of planting.

NITROGEN SERIES.

Two variations of nitrogen, with the other constituents of the mixture remaining constant, were tested against the standard "Control" mixture. In all three mixtures 1,430 lbs. of super. and 210 lbs. of sulphate of potash formed the basis of the manure.

The actual results obtained in this experiment are given in the annexed table:—

Sulph. of Ammonia per acre in lbs.	Lbs. of Nitrogen per acre.	Yield in lbs. per plot 1/100 acres.	Yield in tons per acre.	Percentag Yield.
			T. C. Q. L.	
250	50	162	7 4 2 16	100
500	100	161	7 3 3 0	100
...	...	149	6 13 0 4	92

* Control.

The mixtures containing nitrogen gave a higher yield than that of the non-nitrogenous manure, though apparently there was little, if any, difference by increasing the quantity or sulphate of ammonia from 250 lbs. to 500 lbs. per acre.

SUPER. SERIES.

In this series two variations of superphosphate were used against the standard control mixture. The amount of sulphate of ammonia (500 lbs. per acre) and sulphate of potash (210 lbs. per acre) remained constant. The results of the trial are given below:—

Super. per acre in lbs.	Lbs. of Phosphoric acid per plot.	Yield in lbs. per plot.	Yield in tons per acre.	Percentage Yield.
			T. C. Q. L.	
1,907	400	160	7 2 3 12	98
1,430*	300	163	7 5 2 6	100
1,668	350	176	7 15 1 12	106

* Control.

Though there was a certain amount of difference in yield, yet in no case was that difference sufficient to warrant an increase on the amount of super. in the control mixture.

POTASH SERIES.

In this series two variations of potash, with constant quantities of super. (1,430 lbs. per acre) and of sulphate of ammonia (500 lbs. per acre), were used against the standard control mixture. The details of the trial are given below:—

Sulph. of Potash per acre in lbs.	Lbs. of Potash per acre.	Yield in lbs. per plot 1/100.	Yield in tons per acre.	Percentage.
			T. C. Q. L.	
415	200	153	6 16 2 12	105
210*	100	146	6 10 1 12	100
...	...	151	6 14 3 8	103

* Control.

The table indicates that there was apparently little, if any, increase in yield by adding sulphate of potash to the manure, although an analysis of potash-treated tubers shows an appreciable increase in starch content.

The Action of Liming the Land a Month prior to the Planting of Potatoes.

In addition to the general fertiliser trial at Burekup this year (1929), a liming trial was included. In order to afford a certain basis of comparison, two mixtures of manures containing different quantities of superphosphate and consistent quantities of sulphate of ammonia and sulphate of potash

were used against the standard control mixture. The variations of manure used per acre were:—

(1) 953 lbs. Super. (equivalent to 200 lbs. of Phosphoric Acid per acre).

(2) 1,430 lbs. Super. (equivalent to 300 lbs. of Phosphoric Acid per acre).

(3) 473 lbs. Super. (equivalent to 100 lbs. of Phosphoric Acid per acre).

To all three variations of manure there was added 500 lbs. of sulphate of ammonia and 210 lbs. sulphate of potash.

The land chosen for this trial was of a type similar to that of the potato-growing areas in the Burekup district, and adjacent to the fertiliser trial. The soil varied from a heavy clay loam and red loam to a sand. For a better comparison each manurial treatment—limed or unlimed—was repeated six times, and the individual plots were arranged in strips throughout the experimental area.

Slacked lime at the rate of 2 tons per acre was applied to the land one month prior to the planting of the potato crop. The lime was left on the surface and was well mellowed by rain before it was finally ploughed in during the planting operations.

It was observed during the ploughing, the subsequent cultivation, and finally in the digging, that the ground of the limed plots was much more friable than that in the unlimed portions. No difference in germination in the two areas was noticed, and the table below indicated the results obtained:—

Manure per acre in lbs.	Limed Plots.		Unlimed Plots.	
	Yield per plot in lbs.	Yield per acre.	Yield per plot in lbs.	Yield per acre.
		T. C. Q.		T. C. Q.
953lbs. super.	160	7 2 3	166	7 8 0
500lbs. sul. amm.				
210lbs. sul. pot.				
1,430lbs. super.	170	7 11 3	171	7 12 2
500lbs. sul. amm. ...				
210lbs. sul. pot.				
473lbs. super.	151	6 14 3	146	6 10 1
500lbs. sul. amm. ...				
210lbs. sul. pot.				

An average of all the limed plots against an average of all those which were not treated is shown below:—

Treatment.	Yield per plot in lbs.	Yield per acre.	Percentage.
		T. C. Q.	
Limed	160	7 2 3	100
Unlimed	160	7 2 3	100

Thus a consideration of the average result obtained from the experiment would indicate that liming at the rate of 2 tons per acre, one month prior to planting, has no effect on the yield of potatoes obtained.

The Action of the Fertilisers on Freshly Cut Potato Setts.

In most districts the practice of cutting large potatoes into setts for planting is followed. In such areas some of the growers treat their seed by the "wet-bag" method, while others plants the setts straight off the knife. When cut setts are planted in the furrow, either they are placed in position just before the manure is sown, or just after. In any case, the manure may come into contact with many of the freshly cut surfaces of the setts, unless care is taken to press the cut surface into the "mould" at the side of the furrow. In order to test whether the application of manure to the cut surface of the sett has any injurious effect an experiment was also carried out.

Some seed was taken and cut, and then the setts were thoroughly dusted with manure and then planted. At the time of planting it was noticed that these setts were very squashy and wet. Six plots in different parts of the experimental area were planted. These all received the same attention as those in the rest of the trial area. There was a very poor germination (approximately 3 per cent. only) of the setts on these plots, and from a search made it was found that the setts had rotted away completely. This treatment is actually an exaggeration only of what occurs in numerous South-Western potato districts under ordinary fertiliser application.

Six other plots were planted with the cut surface uppermost. After the row had been planted the manure was sown in the usual manner. A certain amount of manure in consequence fell on the cut surfaces of the setts. During the growing period these plots were less vigorous than those of the control rows, and a loss of 10 per cent. in germination occurred.

Lastly, six rows were planted, and in them the cut surface of the sett was pressed into the mould before the sowing of the manure. This method is the normal method of planting used in the departmental trials. An average from these plots was also taken.

The table given below summarises the results obtained from these three methods of planting freshly cut potatoes:—

Method of Planting.	Average yield per plot 1/100 acre in lbs.	Estimated yield per acre.	Percentage Yield.
Setts well dusted with manure immediately prior to planting	...	...	...
		T. C. Q.	
Cut surface of sett pressed into the mould and fertilizer applied as is usual	151	6 14 3	100
Setts placed cut surface uppermost and fertilizer applied as is usual	137	6 2 1	90

Another method of obviating injury from direct contact of the fertiliser would be to plant the setts after the manure has been sown, and then to place cut surface *uppermost*. However, from the table it will be seen that the best method of planting cut potato setts is to place and press the cut surface into the mould of the furrow prior to the sowing of the manure.

A Summary of the Results obtained by the Trials at Burekup for the last Three Years.

These trials have now been repeated over a period of three years and the results, tabulated below, are calculated on the average result obtained from the yields of these three years:—

SUPER. SERIES—(1927-28-29.)

Manure used.	Average Yield in tons per acre.			
	T.	C.	Q.	L.
1,905lbs. super. ... ... 500lbs. sulph. ammon. ... ... 210lbs. sulph. pot.	8	2	2	0
1,430lbs. super. ... ... 500lbs. sulph. ammon. * ... ... 210lbs. sulph. pot.	8	0	2	24
1,668lbs. super. ... ... 500lbs. sulph. ammon. ... ... 210lbs. sulph. pot.	7	18	0	4

* Control Mixture.

The table indicates that there is no advantage in increasing the weight of superphosphate beyond 1,430 lbs. per acre:—

POTASH SERIES—(1927-28-29.)

Manure used.	Average yield in tons per acre.			
	T.	C.	Q.	L.
415lbs. sulph. pot. ... ... 500lbs. sulph. ammon. ... ... 1,430lbs. super.	7	19	3	8
210lbs. sulph. pot. ... ... 500lbs. sulph. ammon. * ... ... 1,430lbs. super.	7	15	1	12
0lbs. sulph. pot. ... ... 500lbs. sulph. ammon. ... ... 1,430lbs. super.	7	11	3	4

* Control Mixture.

This table shows that by increasing the weight of potash used per acre a small increased yield is obtained. This increase, though progressive, is so small that it is doubtful whether the increased cost of the sulphate of potash is justifiable *in these soils* from a point of yield only.

NITROGEN SERIES—(1926-27-28.)

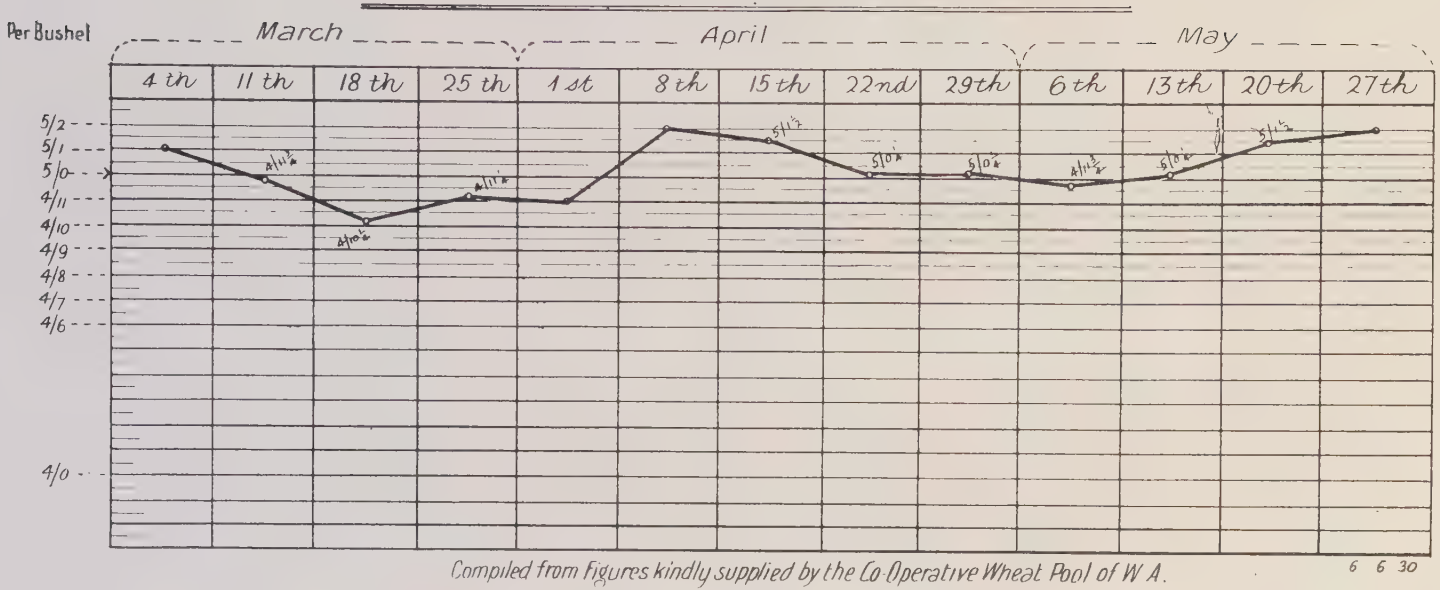
Manure used.	Average yield in tons per acre.			
	T.	C.	Q.	L.
350lbs. sulph. ammon. ... ... 1,430lbs. super. ... ... 210lbs. sulph. pot.	6	19	1	4
500lbs. sulph. ammon. ... ... 1,430lbs. super. * ... ... 210lbs. sulph. pot.	7	8	0	24
200lbs. sulph. ammon. ... ... 1,430lbs. super. ... ... 210lbs. sulph. pot.	7	5	2	6

* Control Mixture.

The variation in yield produced by the variations of the nitrogen was very small, and this would suggest there is little if any advantage in raising the quantity of sulphate of ammonia from 200 lbs. to 500 lbs. per acre. When the figures in the above table are considered from the percentage yield point of view,* it will be seen that in no case was there a 10 per cent. difference in yield. In order to allow for experimental error, no difference under 10 per cent. is regarded as an indication that this or that manurial mixture is more suitable.

* The actual percentage yields in this experiment were for 350 lbs. of Sulphate of Ammonia—96%, control mixture—100%.

Return of Wheat Prices Per Bushel C.I.F.& E. London.



Compiled from figures kindly supplied by the Co-Operative Wheat Pool of W.A.

6 6 30

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK AT METROPOLITAN FAT STOCK MARKETS, FOR MONTHS OF MARCH, APRIL, MAP, 1930.

	March.				April.					May.			
	5th.	12th.	19th.	26th.	2nd.	9th.	16th.	23rd.	30th.	7th.	14th.	21st.	28th.
Sheep ...	13,112	15,247	18,194	16,689	11,392	10,423	12,559	13,651	13,338	11,408	9,168	10,559	11,015
Cattle ...	829	732	853	757	555	603	642	717	725	697	651	483	885
Pigs ...	754	566	871	887	812	665	901	588	1,357	942	740	900	1,073

COMPARATIVE VALUES PER POUND.

	March.				April.					May.			
	5th.	12th.	19th.	26th.	2nd.	9th.	16th.	23rd.	30th.	7th.	14th.	21st.	28th.
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Mutton	6¼	6	5½	5	5½	6	6	6	6	6	6¼	5¾	5½
Beef ...	7	6½	6	6	7¼	8¼	8¼	8¼	9	8	8¼	8¼	7½
Pork ...	9¾	10½	10½	10½	10¼	10¾	10¾	10¾	10½	10¼	10¼	9	8
Bacon ...	9	9	9	9	9	9	9	9¼	9¼	9¼	9¼	8¾	8¼

MARKET REPORT.

Messrs. H. J. Wigmore & Co., Ltd., of Wellington Street, Perth, have supplied us with the following information regarding Chaff available at the Metropolitan Chaff and Grain Auction Sales, held in Perth, for the period March to May, inclusive. In all cases the price quoted is for f.a.q. to prime Wheaten Chaff, packed in new bags:—

	Quantity.	Maximum.	Minimum.
March	1,100 tons	£5 5 0	£5 0 0
April	900 tons	£5 10 0	£5 0 0
May	1,100 tons	£5 5 0	£5 0 0

The period under review has been very disappointing from a grower's standpoint, qualities under f.a.q. to prime being difficult to quit at reasonable prices. At the time of going to press the market for f.a.q. to prime quality is firm, but f.a.q. and mediums are in very poor request at low prices.

Oaten Chaff.—During the past three months heavy supplies were available, and low prices had to be accepted. At one period prime quality sold at as low as £4 7s. 6d., and f.a.q. at £3 17s. 6d. However, during the past few days very little has been available, and the market now stands as follows:—

Prime green—£4 12s. 6d. to £4 15s. per ton.

F.a.q.—£4 5s. to £4 7s. 6d. per ton.

Mediums—£3 17s. 6d. to £4 per ton.

Oats.—The market has been over-supplied, and with a lesser demand auctioneers have been forced to quit consignments at very low rates, the undermentioned being closing quotations:—

Good heavy feed Algerian or Guyras—2s. to 2s. 2d. per bushel.

Medium feeds—1s. 8d. to 1s. 9d. per bushel,

Inferior, lower.

At time of going to press heavy rain is falling, and if our agricultural districts share in this splendid downfall, feed will be very plentiful, and this being the case the prospects of higher prices are very remote.

Wheat.—The market has fluctuated a little in sympathy with overseas prices, fa.q. selling at auction at from 4s. 6d. to 4s. 8d. per bushel; other qualities at lower prices according to sample.

METEOROLOGICAL INFORMATION.

Stations	Temperature.				Rainfall.		Temperature.				Rainfall.		Temperature.				Rainfall.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	MARCH, 1930.						APRIL, 1930.						MAY, 1930.					
					inches.	inches.					inches.	inches.					inches	inches.
Chapman State Farm	90·5	102·0	64·4	51·0	0·34	0·66	80·8	94·4	57·4	48·1	0·57	0·44	76·9	86·4	51·3	44·5	1·17	2·39
Geraldton	85·8	102·0	67·8	56·4	0·07	0·46	79·5	94·0	61·5	52·0	0·98	0·82	74·7	81·0	56·9	48·0	2·63	2·82
Waleibing	88·5	102·1	63·3	53·0	0·65	0·76	78·3	91·0	55·0	45·0	1·36	0·71	73·3	83·0	49·9	41·0	1·85	2·57
Perth	85·4	99·0	66·0	55·0	0·32	0·78	77·2	89·3	57·9	47·8	2·29	1·58	70·8	79·0	54·6	46·5	2·47	4·91
Kalamunda	85·3	97·5	62·8	50·0	0·50	0·86	75·0	88·5	56·4	46·0	2·05	1·88	68·2	79·2	53·1	43·0	2·47	6·21
Bunbury	81·3	96·0	61·4	44·0	0·15	1·01	74·8	87·6	55·0	42·0	0·96	1·73	68·9	75·0	51·4	38·0	2·27	5·31
Bridgetown	86·3	98·8	54·1	39·2	0·78	1·05	78·0	92·8	46·5	38·0	1·06	1·72	68·7	82·0	46·5	32·0	4·15	4·64
Albany	72·8	84·6	60·9	52·0	1·51	1·55	71·2	89·8	55·1	47·0	3·74	2·75	67·8	80·3	54·3	47·0	5·79	5·02
Merredin State Farm	85·9	97·6	64·5	51·9	2·81	1·00	74·3	86·9	55·6	41·8	1·86	0·72	71·3	80·9	49·8	37·8	0·40	1·35
Northam	89·5	100·0	64·5	52·1	0·85	0·73	78·2	91·2	55·4	43·0	1·70	0·79	75·5	84·0	50·7	42·0	0·83	2·23
York	88·6	99·0	62·9	52·0	0·35	0·65	78·0	91·0	53·2	41·0	0·82	0·81	72·5	82·2	49·5	39·2	0·55	2·32
Narrogin State Farm	84·6	98·0	56·5	43·5	1·77	0·77	74·7	86·7	49·7	38·8	0·86	1·15	68·7	79·0	49·0	39·0	1·19	2·84
Katanning	83·5	97·2	58·8	46·0	0·84	0·96	74·2	88·7	50·5	39·7	1·26	1·17	67·6	79·0	49·7	42·3	2·45	2·35
Cape Leeuwin ...	73·3	87·0	63·3	57·2	1·32	1·25	70·4	84·5	60·2	54·0	2·53	2·18	67·7	76·0	57·9	48·5	5·34	5·79

PRODUCERS' MARKETS CO-OPERATIVE, LTD.

Report as follows for three months ending 31st May, 1930:—

Fruit.—For the three months ending 31st May fruit was well supplied. In the early part apples were realising high prices for all varieties and supplies holding throughout. Prices have eased, only prime lines meeting a good demand. D. Seedlings is the only variety short supplied, for which there is a big demand. Lemons realised good prices early, easing with extra supplies forward and firming again towards the end. Tomatoes well supplied early, and sold to a good demand for prime. Small and inferior were hard to quit. They have eased in volume, with prime realising good prices. Pears being short supplied and sold to a good demand throughout for prime. A good quantity of small sized were forward, but these were hard to quit, and realised very poor prices. Fair supplies still remain, the majority being from cool store. Prime are selling to a good demand. Passion fruit realised good values throughout. In March navels were well supplied, selling to a good demand, realising up to 21s. for dumps. They have since continued to increase in volume, and towards the end ¾ bushel of prime realised from 5s. to 10s. 6d., with dumps up to 15s. 6d. Grapes early were heavily supplied and sold to a poor demand, with supplies easing towards the end to improved values.

Vegetables.—Supplies of vegetables during the quarter have been consistently heavy. Values for metropolitan potatoes were low right to the finish of the crop, and growers almost without exception report a severe financial loss. The crop was one of the heaviest experienced in the district, mainly on account of growers using certified seed. It is to be regretted that values were so consistently low throughout the season, as this will curtail their operations next season. Country growers also felt the effect of the depression in the potato market and held consignments back, hoping for the market to rise. The held consignments were badly affected with "fly" when finally marketed and were hard to quit at any price at all. Values during the last month have firmed considerably, and at the present moment are high for good quality lines. A few washed lines are also being offered from the metropolitan area, and these are selling well. Swedes have been short in supply and the demand good, high values selling for well-graded washed lines. Pumpkin has been heavily supplied and the demand weak. We have had considerable difficulty in clearing out at satisfactory rates, inferior grades being quite unsaleable. Cabbage supplies have been heavy, and values for prime lines firm. Country lines were more plentiful this year than previous years. The majority of growers have yet a lot to learn in grading and packing this line for metropolitan markets. It is always advisable when consigning to pay strict attention to the grading, rejecting all second grade and packing tightly. Cauliflowers during the last month have been heavily supplied to a keen demand. Most lines are below the usual standard of quality this season owing to the scarcity of rain during March and April. Values are firm for prime lines, but the inferior grades are low. Peas have been heavier in supply than is usual at this time of the year. Values have been firm and the demand good. Supplies of beans both Runner and French have been heavy to a good demand throughout. White Onions gradually eased off during the period, and are almost finished; now a few lines coming forward from Manjimup district. Local Brown Onions are finished, but the imported lines are plentiful. Sweet Potatoes were

plentiful during the period and values steady. Rhubarb heavily supplied to a steady demand; values have been low. Celery also has been well supplied, and some prime samples offered. Values firm for all prime lines, and at times the inferior qualities sold well. Bunch lines were heavily supplied to a weak demand. Most lines are at glut level. Lettuce have been well supplied to a good demand for prime lines.

Eggs.—On 7th March eggs showed a slight decrease to a keen demand and improved values. Metropolitan hen, 2s. 0½d. to 2s. 2½d. On 12th March demand easier and prices were 1s. 10½d. to 2s. 1d. A further reduction on 21st March brought values to 1s. 7d. to 1s. 11d. On 4th April smaller supplies to a better demand, and hen sold at 2s. 1d. to 2s. 4½d. On 11th April still higher values—2s. 6d. to 2s. 7½d. At the end of April the market eased, values being 2s. 4d. to 3s. 6d. To the middle of May the prices remained unchanged, and eased further on 21st May—1s. 10d. to 2s. 1½d.—and remained unaltered to end of May. Closing prices were: Metropolitan new laid hen, 1s. 10d. to 2s. 1½d.; pullet, 1s. 7½d. to 1s. 9½d; country, 1s. 7d. to 1s. 9d.

Poultry.—On 7th March demand improved for quality birds. Cockerels, 8s. to 11s. 6d.; Muscovy Drakes, 6s. to 7s. 6d.; Ducks 5s. 9d. to 6s. 9d. Turkey Gobblers—none offering. On 21st March lighter supplies to poor demand and values unaltered. Throughout April there was no alteration worth recording, except Turkey Gobblers were supplied at 20s. to 27s. 6d. pair for good birds, and medium from 14s. to 17s. Early May, most prices unchanged except Turkey Gobblers, which showed an improvement—28s. to 32s. 6d. On 16th May most lines still unchanged, although Turkey Gobblers easy—17s. to 25s. Prices for prime quality at end of May were: Cockerels, 8s. to 11s. 6d.; Muscovy Drakes, 9s. to 12s.; Ducks, 5s. 6d. to 6s. 6d.; Indian Runners, 3s.; Pekins, 5s. 6d. to 7s.; Geese, 10s. 6d. to 14s.; Table Hens, 6s. 6d. to 7s. 6d.; Turkey Gobblers, good, 26s. 6d. to 31s.; medium, 16s. to 20s.; Turkey Hens, good, 13s. 6d. to 14s. 6d., medium 10s. 6d. to 11s.

Carcase Meat.—Early March: all lines well supplied to good values; Veal, 8¼d. to 9½d.; Lamb, 6½d. to 7d.; Mutton, 4¼d. to 4¾d.; Mutton, plain, 2¾d to 3½d.; Pork, 9d. to 10½d.; Beef, hinds, 6½d. to 7½d.; fores, 3½d. to 4¼d.

April increased supplies to improved values and about on a par throughout to the end of May.

Closing prices for prime were: Pork, prime, 9d. to 10d.; Veal, 7d. to 8d.; Lamb, 5d. to 7d.; Mutton, 3½d. to 4¾d.

WESTERN AUSTRALIA—DEPARTMENT OF AGRICULTURE.

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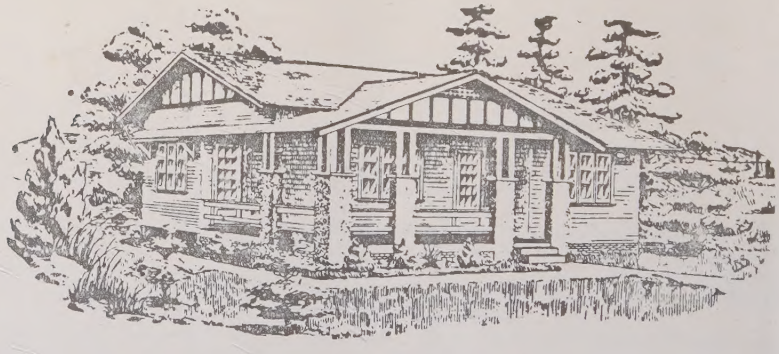

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